



Imperial Bureau of Plant Genetics

(For Crops other than Herbage)

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* General studies, see also individual crops.

Plant Breeding Abstracts.

Vol. VI, No. 3.

Part I. British Empire

STATISTICS 519

- 674 YATES, F. AND ZACOPANAY, I. 519.24:633.1-1.557
The estimation of the efficiency of sampling, with special reference to sampling for yield in cereal experiments.
J. Agric. Sci. 1935 : 25 : 545-77.

This paper on methods of sampling for yield or other characters from experimental plots opens with a discussion of the interpretation of the analysis of variance as applied to sampling results. An expression for the loss of information arising from the adoption of a sampling procedure as opposed to dealing with the whole bulk of material is found. The yield results of eighteen replicated experiments carried out at Rothamsted and associated centres, and of the crop wealth series of experiments, are worked out and compared. The variation between sampling units in the same small plot (usually less than $\frac{1}{100}$ acre) corresponds to a standard deviation per metre length of row of the order of 25-30 per cent of the mean yield. The mean loss of information due to sampling on the main treatment comparisons is 31 per cent. To sample 9 per cent of the total crop may be considered optimal with the present methods and apparatus, but in terms of total work involved little loss of efficiency arises from the current practice of 6 per cent sampling. It is advantageous to sub-divide the plots for sampling. A simplified sampling procedure is sought, and in one set of data a strip one half metre wide cut right across the plot is shewn to form an efficient sampling unit. An alternative method to sampling for yield of grain and straw separately is to weigh the total produce. This method is capable of giving much more precise results than the ordinary procedure ; with only 2 per cent sampling the loss of information is as little as 10 per cent.

J. W.

675. PRZYBOROWSKI, J. AND WILEŃSKI, H. 519.24:633.32-2.51
Statistical principles of routine work in testing clover seed for dodder.
Biometrika 1935 : 27 : 273-92.

The distribution of dodder seeds in samples of clover is shewn by actual experiment to follow the Poisson law of small probabilities. In practice the quality of clover seed is determined by a process which sets an arbitrary limit to the amount of dodder (per kg. of seed) permitted to be present. The authors have used their knowledge of the distribution to construct rules, based on probability considerations, which should be followed in routine work in order to minimize the chance of errors in tests for dodder. Definite rules are not propounded, but the methods, and the necessary tables, are fully explained, and it is suggested that these methods be followed by the appropriate seed-testing authority. The statistical methods of the paper are applicable generally, and should be of use in sampling material where a small proportion of some substance is present (e.g. contamination) which has to be accurately estimated.

J. W.

676. BOSE, S. S. 519.241
Tables for testing the significance of linear regression in the case of time-series and other single-valued samples.
Sankhyā : Indian J. Statist. 1934 : 1 : 277-88.

Based on the exact test for the significance of a regression coefficient deduced from a small sample, these tables give the five and one per cent probability points of the regression coefficient, for a size of sample from 3 to 30 and for a ratio of variances S_y^2/S_n^2 ranging from .05 to 1.00 at intervals of 0.05. They have been calculated from Fisher's Z table for this particular purpose, and should be of considerable use to workers making this type of calculation. Illustrations of the working out of a regression coefficient, and of the use of tables, are provided.

J. W.

677. WATSON, J. 575:633(41)
Plant breeding—1935.
 Res. Annu. Agr 1936 : 40–43.

Breeding work is carried on in grasses, clovers, roots, potatoes and oats.

In roots the work consists of variety tests and continued selection to improve the swede variety Peerless. Seedling selection is being continued in potatoes, though no new seedlings have been raised in the year under review.

Hybridization and selection are carried out with oat varieties and promising strains have been obtained, in particular from Pure line x Yields crosses. Selection for uniformity and improvement is also performed in the older varieties.

678. CHEESMAN, E. E. 575:633:576.16
 633–1.524
Collection and classification of crop varieties and related species.
 Trop. Agriculture, Trin. 1936 : 13 : 3–4.

Emphasis is laid on the necessity for the organization of studies in the taxonomy of the tropical crops and for increasing botanical staffs and carrying out more exploration so that an adequate collection of varieties and also living type collections may be available for breeding work. Examination of the position in research on bananas and cacao has shown that identification and the determination of the total range of variability must precede the classification work which is an important preliminary in the breeding programme. For genetic studies too of both the banana and cacao the discovery and identification of species is shown to be essential to real progress in improving these two crops by breeding.

ORIGIN OF SPECIES, ETC. 576.16

679. THOMAS, H. H. 576.16:537.59
Cosmic rays and the origin of species.
 Nature, Lond. 1936 : 137 : 51–53 ; 97–98 ; also Proc. Linn. Soc. Lond. 1935/36 :
 Part I : 26–31.

In the author's opinion the possibility of a correlation between species variation and the intensity of cosmic radiation at different points on the earth would be worth investigating. Some of Vavilov's information on the geographical distribution of the varieties of crop plants and also data from various sources on wild plants are considered in the light of the theory tentatively advanced above.

680. FAEGRI, K. 576.16:576.12
The species problem.
 Nature, Lond. 1935 : 136 : 954–55.

A suggestion that in the light of the present day evolution theory the basal units of taxonomy should be represented by the different lines of evolution—a view which allows species variation and no longer involves the assumption of constancy as an essential feature of the species.

FIELD TESTS 631.421

681. VAIDYANATHAN, M. 631.421:519
Application of statistics to field technique in agriculture.
 Curr. Sci. 1936 : 4 : 457–68.

A general account is given of the way in which an experimental technique for field trials in agriculture has been developed with the aid of the methods of statistics. The principles of modern experimental design are formulated, and possible objections to randomization are stated and met. The technique of the analysis of variance is explained, together with the extension of the method to two or more variables by means of covariance, while examples are given to show the value of such extension. The author deals with the proper choice of statistics and with the requisite tests of significance. Non-orthogonality of design, whether due to missing plot values or to deliberate confounding, is touched on, and the article concludes with a reasoned programme for future agricultural experimental work in India.

J. W.

PLANT DISEASES 632

682. VERWOERD, L. 632.452:576.16:633.11(68)
The distribution and prevalence of physiologic forms of *Puccinia graminis tritici* in the Union of South Africa, 1930-1934.
 Ann. Univ. Stellenbosch 1935 : 13 : Sect. A : No. 3 : Pp. 7.
 Die fisiologiese vorms van *Puccinia graminis* Pers. wat in Suid-Afrika voorkom.
 (The physiological forms of *P. graminis* Pers. occurring in South Africa).
 S. Afr. J. Sci. 1931 : 28 : 274-79.

In the earlier of these two papers, the occurrence of several physiological forms of *P. graminis tritici* is recorded up to 1929, while the later paper deals with the prevalence, seasonal occurrence and geographical distribution of such forms, as observed during the period from 1930 to 1934. The results, which are tabulated, are taken as shewing that the stem rust problem is much simpler in South Africa than elsewhere ; for one particular physiological form has been found to predominate each year and to the extent of 95.9 per cent for 5 seasons. This should make breeding for resistance much easier even though only a few non-commercial wheats have proved resistant to this virulent form of *Puccinia*.

Annual and more extensive surveys of the prevailing physiological forms are recommended.

683. VERWOERD, L. 632.452:633.1
 633.1-2.452-1.521.6:575(68)
A review of the black stem rust (*Puccinia graminis*, Pers.) situation, with special reference to the experimental methods applied in rust research in the United States of America and Canada, and the nature of the problem in South Africa.
 Sci. Bull. Dep. Agric. S. Afr. 1935 : No. 138 : Pp. 63.

A full account is given of the life-history, methods of study and methods of controlling the fungus. In South Africa the different Schools of Agriculture are co-operating in a Physiological Forms Survey to obtain the information essential to the successful breeding of rust-resistant varieties. It is hoped that the development of such varieties will ultimately achieve for South Africa what has been done in the U.S.A. and Canada.

684. DWYER, R. E. P. 632.951.1:575.42(95)
Derris. Its cultural and economic possibilities for the Territory of New Guinea.
 New Guinea Agric. Gaz. 1935 : 1 : 28-41.

The improvement of forms of Derris by selection is mentioned. Considerable variations have been noted in rotenone content and total ether extract within a single species and in Malaya and Java varieties of *D. elliptica* with high toxic contents have originated by single plant selection. This method is to be tried on the indigenous forms of Derris in New Guinea. An important aim in selection is high ether extract combined with high rotenone content. Mention is made of the need for investigations on the inheritance of rotenone content, which has been shewn to be very variable under environmental conditions.

ECONOMIC PLANTS 633

685. Varieties of crops accepted for registration. 633-1.521.1(73)
 Circ. Canad. Seed Gr. Ass. 1935 : No. 15 : Pp. 8.

A list of the strains and varieties of crops approved by the Canadian Seed Growers' Association for registration as suitable types. The varieties are classified as open and close pollinated.

686. JOGLEKAR, R. G. 633-1.577:575
Factors governing yield of crops (Woodhouse Memorial Prize Essay, 1932).
 Agric. Live-stk. India 1935 : 5 : 683-91.

Among the methods mentioned as means of improving yield are introduction and acclimatization of crop varieties from other countries, selection, hybridization and the grafting of superior bud variations on to stocks that are disease resistant though of low yielding capacity.

687. 633.00.14(56.9)
 633.11.00.14(56.9)
 633.16.00.14(56.9)

Report by Mr. F. A. Stockdale, C.M.G., C.B.E. on his visit to Palestine and Trans-Jordan 1935.

Rep. Colon. Adv. Council. Agric. Anim. Health 1935 : C.A.C. 247 : Pp. 86.

In Palestine efforts are being made to improve cereal crops by experimental work on variety tests at agricultural stations and by demonstration plots distributed throughout the country.

The wheats grown at the present time are relatively true to type, but the barleys are mixed and the Acre station has undertaken line selections to improve them. Wheat varietal tests are also in progress at Acre and seed from promising strains is sent out to the District Agricultural Stations which supply seed for demonstration plots and for sale to cultivators. The establishment of the private seed farm system which has proved so satisfactory in India and Ceylon is recommended as a line of future development.

All classes of European vegetables of high quality are grown and annual tests of varieties are made so that the information which is gradually being accumulated as to the types best suited to the soil and climate should prove valuable if periodically analysed. The use of pedigree vegetable seed should also be investigated as a possible method of improvement.

In Trans-Jordan similar defects in the varietal purity of wheat and barley were observed and good quality seed is even more necessary than in Palestine.

The establishment of an Experiment Station in Trans-Jordan is contemplated if adequate funds are obtainable.

CEREALS 633.1

688. KEMP, H. J. AND PURDY, H. A. 633.1:575(71.24)
Suitable cereals for dry land farming on the prairies.
 Sci. Agric. 1935 : 16 : 135-40.

It is pointed out that although drought resistance is an important desideratum in cereal varieties for the purpose mentioned, other factors of an adverse nature also have to be taken into account, including resistance to or recuperation from the combined effects of wind and soil drifting, efficiency in competing with weeds, resistance to or tolerance of insect attack (especially grasshopper and wheat-stem sawfly). Varietal differences in these respects as noted at the Dominion Experimental Station, Swift Current, Saskatchewan are described and characteristics which are of special importance in relation to one or other of the factors are mentioned.

These factors together with the importance of cereal crops for fodder crops must be considered carefully in the development of a breeding programme.

689. HARRINGTON, J. B. 633.1-2.112-1.521.6:575(71.24)
Cereal crop improvement for dry farming conditions.
 Sci. Agric. 1935 : 16 : 113-20.

Drought, through the chances of its making long periodic visits, is one of the major factors to be considered in cereal improvement for the plains of Western Canada ; at the same time great care must be taken that the attainment of high drought resistance is not achieved at a sacrifice of other equally valuable characters. This is illustrated by a study of the yields of different wheat varieties during the past 10 years at Saskatoon, Sask. During the first five years, which were favourable seasons, Reliance outyielded Marquis by a total of 47.5 bushels, but during the second five years, when drought was prevalent, the difference in favour of Reliance was only

2.9 bushels. Marquis remained much more constant in yield over the whole period and therefore might be considered the more drought-resistant, but the advantage for the whole period was clearly with Reliance.

Similar results were obtained with barley varieties, Trebi comparing with Hannchen as Reliance did with Marquis.

Certain drought-resistant oat selections from Ohio Experiment Station have been tested during the recent dry years, but the work with wheat and barley indicates the need for more extensive testing, covering favourable as well as unfavourable periods. Re-selection work is in progress with this material.

Drought resistance has been stressed in cereal breeding work at the University of Saskatchewan during the past four years and plants have been selected for ability to produce a reasonable length of straw, a reasonably well developed inflorescence and a reasonably plump grain. If more favourable conditions occur in the near future it is hoped to be able to select from the drought-resistant forms thus produced those which can respond to such conditions.

In general the principle emerges that in breeding for areas where drought can be a serious factor but is not permanent the behaviour under both favourable and unfavourable conditions is important.

WHEAT 633.11

690.

ROBERTS, R. P.

The origin of the wheat variety "Bencubbin."

J. Dep. Agric. W. Aust. 1935 : 12 : p. 325.

Bencubbin which originated from a Gluyas Early x Nabawa cross made in 1922 was named in 1931 and in 1934 had displaced Nabawa as the most popular variety in cultivation in Western Australia.

633.11 Bencubbin

633.11:575.12(94.1)

691.

MALABAR.

The lifetime of service. The Romance of New Zealand's wheat.

N.Z. Fmr. 1935 : 56 : pages 929, 962-63.

An article on the wheat improvement work by Professor F. W. Hilgendorf at Canterbury Agricultural College, and on the origin and functions of the Wheat Research Institute in New Zealand.

Among seventeen crosses made twelve years ago one, the well-known Cross No. 7, has recently been widely distributed to farmers.

633.11:575(93.1)

692.

HARRINGTON, J. B.

Character combinations in relation to endosperm development in inter-specific *Triticum* crosses.

Canad. J. Res. 1935 : 13 : 388-99.

633.11:575.127.2:575.114:581.48

In the F_2 progenies from crosses of Iumillo (*Triticum durum*), Vernal (*T. dicoccum*) and Black Persian (*T. persicum*) with Marquis (*T. vulgare*) (see "Plant Breeding Abstracts" Vol. V, Abst. 211), the resemblance to the emmer or *vulgare* parent of a number of characters was analysed, both in plants from shrunken seeds on the one hand and from plump seeds on the other and also in random progenies.

It was found that certain two-character combinations occurred more frequently than others, e.g. field rust reaction of Vernal wheat only occurred once in combination with seed character of Marquis in a random F_2 progeny of 276 plants.

Though differences in the relative frequencies were noted in the combinations occurring in plants from shrunken seed as compared with those in plants from plump seed, the nature and extent of the differences did not indicate that they were significant.

The results are taken to shew that a sufficiently large population would shew all the possible two-character combinations of emmer and *vulgare* characters and no superiority of plants from shrunken seeds over those from plump seeds was indicated.

693.

633.11:581.143.26.03

633.13:581.143.26.03

633.16:581.143.26.03

BELL, G. D. H.

Experiments on vernalization.

J. Agric. Sci. 1936 : 26 : Part I : 155-71.

Following upon the previous experiments (Cf. "Plant Breeding Abstracts," Vol. V, Abst. 849), a series of sowings was made with vernalized and unvernallized seed of winter and spring varieties of barley, wheat and oats, one in October 1934 and six successive ones in the following spring between 8th March and 5th April. The treatment consisted of fourteen days exposure to $+3^{\circ}\text{C}$. All varieties except the Stadler A "Wintergerste" shewed a slight acceleration in germination. The young plants were more erect in the treated plots, the difference being very pronounced in Tschermak's winter barley, where the treated plants were twice as large; the effect differed in the different varieties, being least evident in the spring varieties Abundance oats and Spratt-Archer and Pryors barley. The differences were also less obvious in the later sowings. Examinations of the growing points revealed still clearer differences in varietal behaviour. Tschermak's winter barley again shewed the most pronounced differences and this was detectable at an earlier time than in the others. Thus differences between the treated and control growing points were observed after 34 days, whilst no difference was detectable in the wheat and oats till about the 70th day.

The acceleration in earing was inappreciable or nil in the autumn sowings. In the spring sowings however there was a progressive increase in acceleration with delay in sowing in the winter varieties and conversely, a progressive decrease in the spring varieties. This difference in behaviour is attributed to the rise in temperature with progressive lateness of sowing, in support of which view it is mentioned that greenhouse sowings (higher temperature) came into ear sooner than field sowings in spring varieties and later in most winter varieties, shewing that the low temperatures in the open had effected a certain amount of vernalization. The time required for earing became progressively less with lateness of sowing in the treated winter varieties supporting the conclusion that extension in length of day hastens earing in vernalized sowings. Although the variety Bocumer was later than Tschermak's winter barley in shewing growing point stimulation its acceleration in earing was just as great and similarly the wheat varieties all first shewed growing point stimulation at the same time but Rivett gave a much greater acceleration in earing.

Periodic tiller counts were made on a randomized latin square of the three wheat varieties, treated and control, and the data were subjected to statistical analysis. The rate of tillering was significantly higher in the vernalized than in the unvernallized plots in the early stages but lower in the later counts, so that ultimately the number of surviving tillers and hence mature ears was less in the treated plants of Joss and Rivett than in the controls.

Examinations of the effect of treatments of 7, 14, 21 and 28 days on Yeoman and Rivett wheat shewed 21 to be the best period; little advantage was gained by extending the treatment to 28 days. In the longer exposures $+1^{\circ}\text{C}$. proved slightly more effective than $+3^{\circ}\text{C}$.

694.

AAMODT, O. S. AND TORRIE, J. H.

633.11:581.48:575.11.061.5

Studies on the inheritance of and the relation between kernel texture and protein content in several spring wheat crosses.

Canad. J. Res. 1935 : 13 : 202-19.

F_2 and F_3 progenies from different F_1 plants of the cross between Milturum, a soft, red, Russian spring wheat and Selection I-28-60, a hard red spring wheat were divided into three groups consisting of lines with average texture starchy, average texture semi-vitreous and average texture vitreous. In the first group starchy texture was determined by one main dominant factor, in the second there was one main factor with vitreousness partially dominant while in the third there were two main factors with vitreous texture again partially dominant. Selections I-28-46, I-28-60 and I-28-62 appeared to be heterogeneous for texture; in crosses of these lines with Reward correlation studies shewed grain texture to be inherited.

Protein content was found to be greatly influenced by environment, but studies on progenies from the above crosses demonstrated that it is inherited, apparently on the basis of polymeric factors.

A high degree of association was found between grain texture and protein content in hybrid progenies grown at Fallis (Cf. "Plant Breeding Abstracts," Vol. VI, Abst. 328), but this was not so clearly shewn at Edmonton where grain texture is not so clearly differentiated.

695. HARRINGTON, J. B. AND HORNER, W. H. 633.11-1.531.27:575

The reaction of wheat varieties to different dates of sowing.

Sci. Agric. 1935 : 16 : 127-34.

Statistical studies on the yield and height of different wheat varieties sown at weekly intervals from 15th April to 15th June in each of four successive years shewed significant interaction between date of sowing and yield, indicating that varieties respond differently to the environmental conditions produced by different sowing dates.

On the basis of these results the authors suggest that variety trials might be improved by sowing plots at several dates instead of at one as is the usual custom.

696. 633.11-1.557(54.5)

SIKKA, L. P. D.

A new promising wheat for the Multan district.

Seasonal Notes Punjab Dep. Agric. 1935 : 13 : p. 13.

Data on yield and other features of this wheat C.591 (Cf. "Plant Breeding Abstracts," Vol. VI, Abst. 17).

697. McMILLAN, J. R. A. 633.11-1.557:575(94)

Wheat variety investigations ; progress report. I. Experiments at Canberra, Wagga, Merredin, and Adelaide in 1934.

J. Coun. Sci. Industr. Res. Aust. 1935 : 8 : 316-20.

A note with tabulated data of the cooperative attack which is being made by the Council for Scientific and Industrial Research, the Departments of Agriculture of New South Wales and Western Australia and the Waite Agricultural Research Institute on the problem of defining the more important characters determining yield. Later on their inheritance is to be studied individually.

698. FRANKEL, O. H. 633.11-1.557:581.01

Analytical yield investigations on New Zealand wheat. II. Five years' analytical variety trials.

J. Agric. Sci. 1935 : 25 : 466-509.

The investigations were made on hand-sown chessboard trials and also by census methods on drilled variety trials, the results obtained being essentially parallel in the two methods.

The chief factors studied were plant mortality, tiller development and tiller survival, i.e. the number of tillers maturing heads, the object being to determine the relation of the different factors to yield.

Plant mortality appears to be one of the limiting factors for wheat yields in New Zealand and occurs almost exclusively in the period between three months after sowing and harvest.

Marked and characteristic varietal differences were found in tiller development, in the earliness of the start of tillering, and of the critical period, the period before which tillers must be produced if they are to mature heads, and in the total tiller production. In general, however, early tillering was no index of head formation or of plant yield.

Of much more importance to yield under New Zealand conditions was tiller survival and Tuscan, the variety which covers more than 70 per cent of the wheat land in that country was remarkable for its high tiller survival combined with low tillering and it is considered that the adaptability to varying conditions which it thereby enjoys is largely responsible for its wide popularity. The modern western European varieties were found to rely more on head size for their chief adaptability but under the less favourable conditions obtaining in New Zealand are unable to make use of this character and so give lower yields.

699. VILLIERS, P. J. R. de

633.13:575.11

A genetic study of the inheritance of the various characters in certain *Avena* hybrids.

Sci. Bull. Dep. Agric. S. Afr. 1935 : No. 140 : Pp. 90.

An account of genetical investigations made in the course of breeding work with oats at Stellenbosch-Elsenburg College of Agriculture.

The varieties used are described and a key to them is given.

In studying the inheritance of earliness it was found that the number of factors concerned appeared to differ according to the parents used, but in Fulghum x Boer Oats one main factor was indicated.

A general correlation was noted between earliness and poor tillering capacity.

In two crosses between varieties with glabrous lemmas the results in F_2 and F_3 shewed that there were two factors concerned viz., A , a dominant factor for hairy lemma and T a dominant inhibitor.

A cross between Sunrise (strong awns) and Bancroft (weak awns) gave a segregation into 3 weak : 1 strong in F_2 and in the cross Bancroft x Gidge a similar ratio was obtained. In other crosses made to study the inheritance of awns the results were not so clear and it appears that the genetic constitution of different awnless and weak-awned pure line selections are not always alike ; the degree of awning and the development of awns is moreover greatly influenced by the environment.

The inheritance of length, breadth and depth of grain and percentage of lemma and palea as against caryopsis was studied in the progeny of the cross Bancroft x Sunrise. It was found that the inheritance of length of grain, both primary and secondary, could be explained by the hypothesis that the genetical constitution of Bancroft was $R_1R_1R_2R_2r_3r_3$ and that of Sunrise $r_1r_1r_2r_2R_3R_3$, where $r_1r_2r_3$ are multiple factors for grain length operating additively. No factorial explanations for the inheritance of the other factors mentioned are given.

When the red-grained variety Bancroft was crossed with the black-grained variety Boer oats, 3 black : 1 red were obtained in the F_2 , the hypothesis of a single factor difference being supported by the F_3 results. In the cross Bancroft x Sunrise (white grains) the F_1 had chocolate-coloured grains, suggesting that Sunrise carries a dominant factor A for chocolate-coloured grains but lacks a factor C for the production of colour, having thus the constitution $AAcc$, while Bancroft is $aaCC$. This hypothesis was supported by the F_2 results but not by those from the F_3 .

700. JOHNSON, L. P. V.

633.13:575.127.2:581.142

General preliminary studies on the physiology of delayed germination in *Avena fatua*.

Canad. J. Res. 1935 : 13 : 283-300.

The investigation was begun as a preliminary to a genetical study on delayed germination (Cf. Abst. 701 below) but was extended to include physiological phases of the problem having no direct bearing on the genetical work.

It was concluded, *inter alia*, that delayed germination is associated with the nature of the seed coat (pericarp and testa) which is determined by post-fertilization changes. In *A. sativa* and in hybrid grains resulting from pollinating *A. fatua* by *A. sativa* the nature of the seed coat is such that oxygen has easier access to the embryo than in *A. fatua* grains and the after-ripening process of the latter may consist essentially of a series of changes in the seed coat which result in increased permeability to oxygen.

Correlations observed between seed weight and germinability after 18 months in different selections of *A. fatua* are attributed to hybridization with the heavier-seeded, readily germinable *A. sativa* forms.

701.

633.13:575.127.2:581.142

JOHNSON, L. P. V.

633.13:575.11

The inheritance of delayed germination in hybrids of *Avena fatua* and *A. sativa*.

Canad. J. Res. 1935 : 13 : 367-87.

The grains of *Avena fatua* require a relatively long after-harvest ripening period before germinating and may be described, from the point of view of tests made shortly after harvesting, as

non-germinable, while those of *A. sativa* from the same point of view are germinable. The F_1 seeds from reciprocal crosses were all germinable.

In the F_2 however the distribution of plants into different phenotypic classes, as based on the average behaviour of their (F_3) grains, was not clear-cut and could not by inspection be assigned to any simple Mendelian ratio. There was a marked correlation between the *sativa* type of grain and germinability.

Several hypotheses were worked out to see which would fit the results best and it was found that the following gave the most satisfactory fit, viz. germinability is inherited on the basis of three factor pairs of more or less equal strength, one of which is linked with the factor for grain type; at the time of testing, embryos carrying one dominant allelomorph only were, like those with six recessive allelomorphs, non-germinable, those with three or more dominant allelomorphs were germinable and others varied; but the germinative capacities of genotypes varied with the time elapsing between harvesting and testing.

Though the data from the grain of F_3 plants did not actually contradict this hypothesis, it is considered that the total evidence is not sufficiently strong to prove it definitely; at the same time, however, the results are taken as strong indications that the explanation is as given. The genotypes of the two parents would then be *A. sativa* (wa_1) (wa_1) $A_2A_2A_3A_3$ and *A. fatua* (Wa_1) (Wa_1) $a_2a_2a_3a_3$, where W is the dominant factor for *fatua* type of grain and A_1 , A_2 and A_3 are the dominant factors for germinability.

BARLEY 633.16

702.

JOHNSTON, W. H. and AAMODT, O. S.

633.16:575.11.061.5:581.46

633.16-2.4-1.521.6:575

The breeding of disease-resistant smooth-awned varieties of barley.

Canad. J. Res. 1935: 13: 315-38.

The results from the F_2 of reciprocal crosses between Trebi (rough-awned) and Velvet (smooth-awned) and the F_2 and F_3 of reciprocal crosses between Trebi and Glabron (smooth-awned) indicated that barbing of awns is genetically controlled by two factor pairs RR and SS . R is the main factor for barbing of awn; S is hypostatic to R and in the absence of R produces an intermediate condition, while the double recessive produces the smooth-awned type.

The inheritance of earliness of heading as studied in F_3 lines of reciprocal crosses between Glabron and Trebi could best be explained by a polymeric factor hypothesis. Transgressive segregation was noted.

Several factors operating cumulatively were also required to explain the inheritance of height which was studied in a similar manner.

Attempts were made to study the inheritance of reaction to loose smut but failed owing to inoculation of F_3 seeds producing no infection.

In studying the inheritance of resistance to stripe disease (*Helminthosporium gramineum*) the flowers of F_2 plants were inoculated to produce infection in the F_3 generation of reciprocal crosses between Trebi (highly resistant) and Glabron (moderately resistant.) Though in general the reaction of F_3 lines resembled that of Trebi, the wide range of infection exhibited by Glabron indicated that the method of inoculation used was not sufficiently reliable. No definite mode of inheritance is suggested.

High significant correlations obtained in F_3 lines between mean height of plant and mean number of days to heading are taken to shew that certain of the factors responsible for earliness of heading also determine plant height. No significant correlation was obtained between mean number of days to heading and percentage stripe infection but a significant correlation was noted between mean plant height and percentage stripe infection, which may indicate slight genetic linkage.

703.

PETO, F. H.

633.16:576.356.2:581.036.1

635.656:576.356.5:581.04

Associations of somatic chromosomes induced by heat and chloral hydrate treatments.

Canad. J. Res. 1935: 13: 301-14.

By four slightly different treatments, all involving germinating grains of *Hordeum vulgare* at 35-36°C., abnormalities were produced in the root tip nuclei. In addition to the frequent

occurrence of tetraploid nuclei there were noted fragmented chromosomes, chromosomes with a broken chromatid and many configurations resulting from the union of fractured ends. An association of two fractured chromosomes by the union of the broken ends of chromatids produced a chiasma very similar to that arising in a different way at meiosis.

Associations of one and a half and of three chromosomes by such chiasmata were also observed. The chromosomes associated were not necessarily homologous.

The observations suggest that broken ends of chromatids have an unsatisfied affinity or bond and will rejoin with any broken end which is lying near in the nucleus. The significance of the results in shewing how structural changes and elimination of parts of chromosomes can occur in somatic tissue is discussed.

In the root tips of seedlings of *Pisum sativum* treated with chloral hydrate many tetraploid and a few octaploid nuclei were found. It is suggested that they arose by failure of cytokinesis after mitosis, followed by the formation of restitution nuclei.

In these polyploid nuclei there were seen associations of chromosomes superficially resembling meiotic bivalents, but critical examinations revealed that no chiasmata were present and it is considered that they merely result from faulty separation of daughter chromosomes at anaphase, especially as they were never found in diploid nuclei.

704. BISHOP, L. R. 633.16:663.421:575 -

Barley varieties for brewing.

J. Inst. Brew. 1935 : 41 : 329-34.

The results of a series of tests of barley varieties are tabulated and discussed and on them are based certain recommendations. Golden Archer and 35/51 (both Archer hybrids) are recommended as the best two-row varieties for the farmer, valuer and for the brewer and maltster needing high extract, easy modification and a low percentage of nitrogen on wort solids ; B.244 from the cross Archer x Precox, is the best English six-row variety for the same purposes. For brewers needing easy modification but high percentage of nitrogen on wort solids Standwell and July are the best two- and six-rowed varieties respectively.

From the breeding point of view the ideal for the farmer and for the brewer needing low percentage of nitrogen on wort solids would be to combine the high yield, good appearance and low nitrogen content of a new variety like Golden Archer with the high extract yield and low wort nitrogen of the Continental variety Kenia. On the other hand for the brewer asking for high wort nitrogen it would be desirable to combine the good qualities of Golden Archer with the high extract yield and high wort nitrogen of Standwell, which has a low and variable yield.

MILLETS AND SORGHUMS 633.17

705. 633.171:575.11.061.6

RANGASWAMI AYYANGAR, G. N. and HARIHARAN, P. V.

**Chlorophyll deficiencies in *Pennisetum typhoides* (Stapf. and Hubbard).
The pearl millet.**

Madras Agric. J. 1935 : 23 : 394-97.

A type of chlorophyll deficiency producing white, non-viable seedlings was found to be due to a single factor *c*, the dominant *C* producing fully green plants. The expression of the latter was affected by another recessive factor *e* which segregated independently of *C* and produced pale green plants of reduced vigour. A fully green plant therefore has the constitution *CCEE*.

The significance of such types of chlorophyll deficiencies in breeding work is briefly discussed.

706. 633.171:581.46:575.11

RANGASWAMI AYYANGAR, G. N. and HARIHARAN, P. V.

***Pennisetum typhoides* (Stapf and Hubbard), and *Pennisetum leonis* (Stapf and Hubbard).**

Madras Agric. J. 1935 : 23 :

One of the main differences between *P. typhoides* and *P. leonis* is that the glumes of the latter are ciliate, which in crosses between the two is seen to be due to a single factor, the ciliate condition being dominant over glabrous.

707. RANGASWAMI AYYANGAR, G. N., 633.174:575.127.2:575.11
 PANDURANGA RAO, V. and KUNHIKORAN NAMBIAR, A.
**The inheritance of some characters in crosses with the sorghums,
 Milo and Kafir.**
 Proc. Indian Acad. Sci. 1935 : 2 : 508-22.

In studies on the progeny of crosses between the African varieties Kafir (*Sorghum caffrorum*, Beauv.) and Milo (*S. caudatum*, Stapf.) the following results were obtained :

The wavy leaf margin of Milo is produced by a single factor *Mu* and is dominant over the flat margin of Kafir (*mu*) ; this single gene is associated also in the dominant condition with larger panicles, thicker stalks and wider leaves in Indian varieties.

The corrugated character of the junction of the leaf-blade with the leaf-sheath in Milo is due to a single recessive gene *jc*, the usual flat junction being due to *Jc*.

In Milo the leaf edges dry up at about the pre-ripening stages of the grain ; this condition is occasioned by a single dominant gene *Md*, while the more usual, non-drying condition as in Kafir is due to the recessive *md*.

The umbonate shape of the grain of Kafir is determined by a single gene *U* and is dominant to the obovate condition of Milo.

The awns of Milo have purple subules. The inheritance of this character could not be studied in crosses with Kafir as the latter is awnless. In crosses with a variety of *Sorghum Durra*, Stapf. with the usual colourless subule the purple character was found to be due to a single dominant gene *Ap*.

It was found that *Mu* and *Jc* are independent of the grain colour character *W* (see " Plant Breeding Abstracts " Vol. IV, Abst. 310) and of *Md*. The factor *Md* is independent of the grain colour factors *R* and *I* (see " Plant Breeding Abstracts " *loc. cit.*).

The factor *U* does not affect *W*, and *Ap* is independent of *R*, *I* and *Md*.

708. RANGASWAMI AYYANGAR, G. N. and 633.174:581.331.2:575
 PANDURANGA RAO, V. 633.171:581.331.2:575
Dummy pollen.
 Curr. Sci. 1935 : 4 : p. 315.

Examination of the pollen of 8 varieties of sorghum since 1931, revealed the presence of a certain amount of non-germinating pollen of a type in which the grains are devoid of solid contents, comparatively small in size (31-34 μ) but unshrivelled and of normal shape.

Similar pollen is found in *Andropogon* and in *Pennisetum typhoides*. It may perhaps have some possible functional significance in ensuring dehiscence in night flowering millets.

An instance is cited of recessive behaviour of the character paucity of dummy pollen, with consequent non-dehiscence of the anthers.

709. RANGASWAMI AYYANGER, G. N., 633.174:581.45:575
 PANDURANGA RAO, V. and KUNHIKORAN NAMBIAR, A.
**Inheritance of characters in sorghum—the Great Millet. VII. Ligule
 and auricle.**
 Indian J. Agric. Sci. 1935 : 5 : 539-41.

An eligulate and non-auriculate condition was met with in two instances, one in Sudan grass and the other in Broom corn, and was found to behave as a simple recessive to the normal ligulate and auriculate condition.

B. P. P.

710. RICE 633.18 633.18:575(91)
**Report on the progress of schemes for the improvement and extension
 of rice cultivation.**
 Kuala Lumpur 1935 : Pp. 12.

Part of the work consists of selecting high yielding pedigree strains from good local varieties, which is carried out at five padi experiment stations situated in Kedah, in the Krian district, in the Kuala Kangsar district of Perak, in Malacca and in Kelantan respectively. The work is

closely co-ordinated and selected strains are freely exchanged between the various parts and tested on the local padi test stations or plots. The work of testing has been systematized by adopting a standard form of Latin square for comparative tests of four or five strains, using a well-known strain or a local variety as a standard.

In those areas where practically all the padi is consumed by the cultivators the palatability of the rice from a selected strain is important, while in other areas, where the surplus after the growers' requirements have been met is sold for milling, the milling qualities of the rice have also to be considered; the cultivation of a single strain over as wide an area as possible is also of importance in the second type of area, in order that large supplies of uniform grain may be obtained. A fairly uniform maturation period is to be desired in all areas.

Hybridization work is also in progress.

Seed of improved pure lines has been distributed in different districts.

711. 633.18:575.11.061.6

RAMIAH, K. and RAMANUJAM, S.

633.18:575.182.061.6

Chlorophyll deficiencies in rice (*Oryza sativa*).

Proc. Indian Acad. Sci. 1935 : 2 : 343-68.

The different types of chlorophyll deficiency in rice are reviewed, including nine shewing Mendelian inheritance and three shewing maternal inheritance.

Among the Mendelian types the inheritance of albino (*ww*), virescent yellow (*vv*) and green and white striped (*gwgw*) was studied with a view to working out the inter-relationships between the different kinds. It was found that they were inherited independently of each other, any two together giving a 9 : 3 : 4 ratio.

Other Mendelian types described include lutescent seedlings *ll*, and lethal yellow (*xantha*) *yy*, each controlled by a single factor pair. Chlorina i.e. pale green plants and zebra-marked seedlings, having horizontal bands of white on the leaves in the early stages of growth have also been observed and their mode of inheritance is being studied. Green and yellow striped plants later turning pure green have also been noted and families segregating from this character gave ratios of 2 green : 1 striped plant; this is also being investigated.

The frequent sudden appearance of chlorophyll mutants in inbred lines of rice suggests that the plant is rather unstable in this character.

The three types shewing maternal inheritance are green and white variegated, green and yellow variegated in which the yellow fades into white as the plant matures, and green and yellow variegated in which the yellow does not change. Of particular interest are certain yellow plants obtained from the third type; unlike most yellow plants, which die after 8 to 10 days, certain of these have survived as long as three months after germination. If, as appears possible, they mature seed, they would provide valuable material for the study of this type of inheritance.

712. 633.18.0015(54.8)

LOWE, B. A. 633.18:575.1

633.18-2.484-1.521.6:575.12

Rice research in Madras. A report of a visit to Coimbatore in July 1934.

Malay. Agric. J. 1936 : 24 : 7-18.

In this report the organization and aims of research on rice in Madras are outlined. The main lines of development are the study and improvement of cultural methods, morphological and physiological studies of varieties, selection for improved yield and quality, the production of new varieties by hybridization, and also genetical and cytological investigations. An attempt is also being made to obtain types resistant to Padi blast (*Pricularia oryzae*) by crossing resistant selections with the Malayan rice Korangusamba.

The inheritance of a very large number of characters, such as colour, grain size and shape, plant height, earliness, disease resistance, etc. has been studied, while the occurrence of heterosis, chromosome aberrations in interspecific crosses and in dwarf plants, sterility, artificial mutation, chromosome ring formation have also been investigated.

Vernalization experiments are also in progress.

A collection of varieties is also being made and maintained and a certain amount of classification work has been done.

713.

633.51 No. 43-F
633.51:575.42(54.5)**43-F—a new early maturing strain of Punjab-American cotton.**

Department of Agriculture, Punjab. Leaflet No. 126.

Seasonal Notes Punjab Agric. Dep. 1935 : 13 : 61–63.

Earliness, jassid resistance, good lint and staple length and a yield superior to 4-F are the main features of this new cotton which is now ready for distribution.

714. HARRISON, E.

633.51:575.42(67.8)

Cotton in Tanganyika Territory.

Emp. Cott. Gr. Rev. 1936 : 13 : 1–11.

The bulk of selection work which has been carried on for many years in Tanganyika has not yet yielded any outstanding types. So far lint length has been the main consideration in selection, but yield and robustness have been found to deteriorate as the lint length was increased.

The most promising line of work is thought to be mass selection from existing cotton fields for a robust type with even lint, good powers of drought, pest and cold resistance.

In the general improvement of the cotton crop grown by planters and natives the question of the grading of seed cotton is important.

Variety trials and selection work and multiplication are carried out at various cotton experiment stations in the Eastern Province and the Lake Province.

715. HARLAND, S. C.

633.51:576.16:575.1

The genetical conception of the species.

Biol. Rev. 1936 : 11 : 83–112.

After a review of other genetical work on species problems, the author describes and discusses his own work on *Gossypium* in relation to the genetical conception of the species. The published work referred to has been reviewed in "Plant Breeding Abstracts."

It was found that all characters exhibiting simple monohybrid behaviour within the species exhibited complicated and often continuous blending in the F_2 of interspecific crosses, *hirsutum* and *barbadense* being the species on which most work has been done ; the hypothesis was put forward that different species differed in the complex of modifying genes associated with the major genes and that it was the segregation and recombination of these which were responsible for the blending type of inheritance. The truth of this hypothesis was demonstrated by the fact that by back-crossing the heterozygote repeatedly to one or the other parent species clear-cut monohybrid segregation could again be obtained. In this way it was possible to transfer genes from one species to another, demonstrating the existence of homologous loci in different species and also gaining a knowledge of the genetical architecture of the different species.

The distribution of the genes at 16 loci is known in *hirsutum* and *barbadense* and it appears that they are alike in seven recessive genes and one dominant. In respect of the other genes the commonest situation is that at a given locus there is a series of multiple allelomorphs, some of which characterize *hirsutum* and some *barbadense*. This situation may also exist with reference to the recessives and one dominant mentioned above but this needs further investigation.

In a similar way the constitution of *purpurascens*, *taitense*, *tomentosum* and *Darwinii* with respect to these major genes can be tabulated. It is found that *purpurascens* and *taitense* shew no well-marked differences from *hirsutum*, though it appears that they have their own special allelomorphs at certain loci. In *tomentosum*, endemic in the Hawaiian Islands, wider differences are found and it is doubtful whether any of the dominant genes are identical with those of the other species, though identity of loci has been demonstrated for nineteen factors ; two new genes, K^T (khaki lint) and H^T (hairy plant body) have been found which do not occur in any of the other species.

The existence of loci in Asiatic cottons, with $n = 13$ chromosomes, homologous with loci in the New World cottons with $n = 26$ chromosomes has also been demonstrated, the factor R , a member

of a multiple allelomorph series in the former, proving to be also a member of a similar multiple allelomorph series in the latter, though here again the associated complex of modifiers was very different in the two groups and greatly affected the expression of the gene.

By the method of repeated back-crossing several dominant genes have been transferred from *barbadense* to *hirsutum* and it has been found in general that their expression is diluted in the latter, apparently indicating that the presence of the dominant genes in *barbadense* is in some way connected with the presence of plus modifiers, the converse holding in *hirsutum*.

The behaviour of the crinkled dwarf mutant has thrown much light on the nature and function of modifier complexes. This recessive mutant has been recorded four times in *barbadense* but never in *hirsutum*; by back-crosses it has been transferred to different varieties of *hirsutum* and its behaviour there has been studied. In *barbadense* the heterozygote is normal, 3:1 segregation being obtained in the F_2 and the same is true in *hirsutum* T 57. In interspecific crosses, however, whether normal x crinkled or crinkled x crinkled, a series of forms is obtained in the F_2 and it is found that homozygous crinkled on some backgrounds is pseudo-normal and heterozygous crinkled on other backgrounds is phenotypically crinkled. Furthermore, by placing the normal allelomorphs of crinkled occurring in different forms on the respective backgrounds of *barbadense*, *hirsutum* T 57 and *hirsutum* T 9 it has been found that these three types are characterized by different normal allelomorphs, which can only be distinguished by their reaction to the different modifier complexes. The *barbadense* allelomorph is the strongest and shews complete dominance on all three backgrounds; the *hirsutum* T 57 shews complete dominance on its own background, nearly complete on T 9 and incomplete on *barbadense*; the *hirsutum* T 9 allelomorph exhibits incomplete dominance on its own crinkled background and also on *barbadense*. It is considered that *hirsutum* T 9 has had its modifier complex impaired by *barbadense* genes.

These results have a bearing on Fisher's theory of dominance and do not altogether support it, for complete dominance exists in a species where the mutant has never occurred and it has also been shewn that the main genes themselves differ in their potency quite apart from the effect of modifiers.

The occurrence of homologous characters throughout a genus or a series of related genera is a common phenomenon which also occurs in *Gossypium*. It is now known that there are three ways in which such homologous characters as red and green plant body, yellow and cream pollen and so on can be built up, viz. by using different members of a multiple allelomorph series together with a specific modifier complex, by using different members of a pair of duplicate genes in association with a specific modifier complex or by accumulation of plus modifiers in the absence of the main gene (e.g. pseudo-normal mentioned above).

The existence of widely different methods of constructing homologous characters is of great interest in relation to species problems in general, though in this case it is partly due to polyploidy. In general it appears that the species of *Gossypium* though possessing homologous loci, differ considerably in genetical architecture as a result of long separation. Apart from chromosome changes, however, there is no reason to suppose that any process but gene substitution and natural selection has taken place.

As a result of these differences floral abnormalities for instance are fairly frequent in interspecific crosses, but the fact that most combinations possess perfect flowers argues that the species possess either a common stock of genes or an assemblage of mutually replaceable ones.

716. RAMANATHA AYYAR, V.

633.51:581.162.3:578.08

An inexpensive method of selfing cotton flowers.

Emp. Cott. Gr. Rev. 1936: 13: 28-30.

The method recommended for its simplicity, efficiency, rapidity and cheapness consists in preventing the flower bud from opening by smearing the tip with potters' clay mixed with water and by sticking a few cotton fibres dipped in the clay liquid on to the tips of the flowers.

The application of moist clay to the staminal column was also tested as a method of emasculating flowers in raising F_1 seed on a commercial scale, and a good measure of success is stated to have been obtained.

717. 633.51-1.421
633.51-2.484-1.521.6
633.51-2.6-1.521.6
HUTCHINSON, J. B. and PANSE, V. G.
Studies in the technique of field experiments. III. An application of the method of covariance to selection for disease resistance in cotton.
 Indian J. Agric. Sci. 1935 : 5 : 554-58.
 Certain 5 x 5 Latin squares were laid out to test root-rot disease resistance in the case of a number of strains of cotton varieties, some of these being survivors from root-rot infested fields. In order to measure variations in the intensity of the disease over the experimental area, alternate rows of each plot were planted with a standard variety. It was then possible to analyse the percentage of mortality among all varieties, adjusted for regression on the inter-sown standard, by means of the analysis of covariance. The regression was in all cases significant, and the error mean square was reduced by half after adjustment, giving the same advantage as would be gained by doubling the number of plots. The advantages of such an experimental method are discussed and its particular interest for the plant breeder with only limited quantities of seed available for the comparison of strains is pointed out.
J. W.
718. 633.51-1.421
633.11-1.421
HUTCHINSON, J. B. and PANSE, V. G.
Studies in the technique of field experiments. IV. A study of margin effect in variety trials with cotton and wheat.
 Indian J. Agric. Sci. 1935 : 5 : 671-92.
 A number of variety trials with cotton and wheat have been examined to test the effect of margins on yield, and the extent of its variation on different plots. In some cases unprotected margins were available for examination ; in others the plots were surrounded by sown areas. Where detailed study was possible, this was effected by examining separately three marginal rows and three adjacent short distances at the ends of the rows. The magnitude of the effect of margins on mean yields was shewn to depend primarily upon the extent of the differences between the varieties included in the trial ; where the differences were great the margin effect was large, but where the differences were small there was little or no effect. In the latter case the efficiency of the experiment was improved by a reduction of error through including marginal areas. It was concluded that where markedly different varieties are to be compared, one row on either side of the plot should be adequate for side margins, and three to four feet at each end. The data shewed that in almost all varieties studied competition between varieties was less than between plants of the same variety. The importance of surrounding the experiment with guard rows of bulk crop to protect the outside plots, when margins are included in the experiment, is emphasized, and it is suggested that wider margins are probably necessary with agronomic experiments, where there may be large differences in treatment.
J. W.
719. 633.51-1.421:677.21:578.081
633.51:519.24
HUTCHINSON, J. B. and PANSE, V. G.
Studies in the technique of field experiments. II. Sampling for staple-length determination in cotton trials with a note on the standard error of estimates of ginning percentage.
 Indian J. Agric. Sci. 1935 : 5 : 545-53.
 By measuring the maximum halo-length on one side of each of 10 combed seeds per plot of two randomized block experiments, each with six replications, data were provided for investigating the sampling error of staple-length determinations in comparison with plot error. Statistical analysis shewed that plot replication was more important in reducing error than multiplying the number of seeds chosen from each plot, or plant. A significant difference of 1.5 mm., which is sufficient for practical purposes, could be attained by taking the mean of 5, instead of 10, measurements per sample. It is recommended that in replicated trials, samples for staple-length measurement should be taken from each plot, and not from the pooled product of all plots of any one variety.
J. W.

SUGAR PLANTS 633.6

720.

633.61 Co.301
633.61:575(54.8)

New cane variety released.

S. Afr. Sug. J. 1935 : 19 : p. 605.

Co. 301, the new cane is characterized by a thick growth of long leaves. In colour of stem and leaves it resembles Uba. Its canes are only a little thicker than those of Uba and it holds its trash firmly. In tests for three seasons it appeared quite free from streak disease.

721.

633.61:001.4
633.61:575

ROSENFELD, A. H.

Nomenclature and genetics of sugar cane seedlings.

Int. Sug. J. 1935 : 37 : p. 484.

In continuation of the previous note (Cf. " Plant Breeding Abstracts " Vol. VI, Abst. 362) some parentages of additional Coimbatore seedlings are given, thus bringing the previous list up to date.

722.

BURT, B. C.

633.61:575(54)

The Indian Sugar Industry.

Seasonal Notes Punjab Agric. Dep. 1935 : 13 : 49-59.

In this paper a survey of the development of sugar cane breeding in India is included with a table shewing the increasing areas under improved varieties from 1923-1935.

723.

KHANNA, K. L.

633.61:575(54.1)

Scientific report of the Sugarcane Research Station, Bihar and Orissa, Mushari for the year ending the 31st March, 1934.

Bull. Dep. Agric. Bihar Orissa 1935 : No. 6 : Pp. 47.

Studies of growth and development in different varieties have been carried out in relation to vigour and to different environmental conditions. In studying the effect of salt-laden land it has been found sugar cane grows best in a medium of pH 7.1, but that varieties differ in their reactions to more alkaline conditions.

Three types of varieties could be distinguished in root studies viz., semi-mesophytic, with roots penetrating laterally more than vertically, susceptible to drought and varying in root-hold ; semi-xerophytic, with lateral spread of roots about equal to vertical penetration, root-hold variable, less susceptible to drought and including many high yielding varieties ; xerophytic, with vertical penetration 2.5 to 3 times lateral spread, root-hold always strong and lodging rare. These types are in the main unchanged by environmental conditions except that where the water table was high the third tended to resemble the second. In respect of root tensile strength, descendants of wild *Saccharum* species shewed the greatest and noble canes the least strength.

Varietal differences in drought resistance were found to be correlated with high root and osmotic pressures. Tolerance of flooding was correlated with a number of morphological characters including profuse aerial rooting.

Other characters studied include lodging and pulling strain, leaf blade area and morphology, rind hardness (Cf. " Plant Breeding Abstracts," Vol. VI, Abst. 73), pith and cavity development and vitality.

Seedlings have been raised by selfing and crossing Coimbatore canes and P.O.J. 2878 ; there are indications that the selfing of desirable varieties may prove a useful method for the raising of valuable new types.

Variety trials have been carried out with Coimbatore canes and Co. 299 and Co. 313 appear to be promising varieties, the former as an early cane and the latter as a possible rival to the popular Co. 213.

724. McINTOSH, A. E. S. 633.61:575(72.92)
British West Indies Central Sugar-cane Breeding Station.
 J. Jamaica Agric. Soc. 1935 : 39 : 751-58.

The substance of this article has been reviewed already (Cf. "Plant Breeding Abstracts," Vol. VI, Abst. 368).

In dealing with the problems of Jamaica in particular it is stated that there are three main types of land, viz. fertile soils where mosaic is absent or can be controlled, fertile soils where mosaic is uncontrollable in susceptible varieties, and infertile lands. For the first, thick canes of the noble variety may be used, an early and a late ripener, for the second varieties resembling noble canes but with commercial resistance to mosaic are being bred by repeated nobilization of Java "glagah" while for the third, nobilizations of several wild canes are being tried.

725. McINTOSH, A. E. S. 633.61:575(72.98)
An account of the methods employed in testing and selecting sugar cane seedlings for thick-cane areas in the British West Indies.
 Bull. B.W.I. Cent. Sug. Cane Breed. Sta. 1935 : No. 9 : 1-19.

A very detailed account of the principles and practice applied in the breeding of thick canes for the British West Indies (Cf. "Plant Breeding Abstracts," Vol. VI, Abst. 368).

726. McINTOSH, A. E. S. 633.61:575(72.98)
Report of the Geneticist for the year 1934-35. 633.492:575(72.98)
 Agric. J. Barbados 1935 : 4 : 95-128.

The report deals with the breeding of sugar canes and sweet potatoes.

A list is given of the types of crosses made in sugar cane and the fertility of the new crosses is described. In accordance with the change in the testing of first year seedlings (Cf. "Plant Breeding Abstracts," Vol. VI, Abst. 368) the seedlings from the crosses made in 1934-35 will become the B.37' series and there will be no B.36' series.

The numbers of seedlings of different types selected from the B.35' series is given and the B.34', 33' and 32' series are also briefly discussed. Of the B.34' series B.3439 has been so promising in the multiplication plots that it was promoted direct to the routine second year trials of the B.33' series of seedlings. B.3259 and B.3267, both from the cross Ba.11569 x B.H.10(12) have been selected from the B.32' series for further trial.

In the select seedling trials B.3013 has shewn sufficient promise to be included in variety trials. It competes with B.726, is much easier to cut and less susceptible to rotting.

The results of variety trials are also reported.

The work on sweet potatoes consists of trials of seedlings previously raised. The varieties B.5 and B.6 have been recommended as catch-crop varieties to replace Red Nut and Six Weeks, while B. 44 is recommended as a long-crop variety to replace Black Rock. Further selections have been made as a result of tests of catch crop and long-crop series from seedlings raised in 1932.

727. L(EAKE), H. M. 633.61:575(88)
The sugar cane in British Guiana. 633.61:575.127.5:633.174
 Int. Sug. J. 1936 : 38 : 6-8.

This article reviews the more recent publications of the Guiana Department of Agriculture. The Annual Report of the Department for 1934 notes that the standard variety D 625 is gradually being replaced by newer canes such as Diamond 10 and P.O.J. 2878. Several seedlings of more recent date promise to improve upon these latter and six seedlings have been obtained from a back-cross of *Saccharum* x *Sorghum* hybrid to *Saccharum*.

An account of the variety trials, conducted for the dual purpose of eliminating older, valueless varieties and of testing the later productions, are described in greater detail in Sugar Bulletin No. 4. No less than 6 of the 1930 series have surpassed both P.O.J. 2878 and Diamond 10, particularly D 49.30—a cross between Diamond 10 and SC12/4— which yielded 42 per cent more than D 625 and 23 per cent more than P.O.J. 2753. (Cf. "Plant Breeding Abstracts," Vol. VI, Abst. 378).

H. M. L.

728. DAVIES, J. G. 633.61-1.557:001.4
A simple explanation of the technological terms used to express the results of sugar-cane experiments.
 Trop. Agriculture Trin., 1935 : 12 : 333-36.
 Three methods commonly used in calculating the results for plot or field samples are explained and exemplified and the technical terms are defined.
729. KING, N. J. 633.61-2.111-1.521.6:575
Frost damage in cane.
 Qd. Agric. J. 1935 : 44 : 733-36.
 Contains a brief note on recent experiments shewing that there are 4 degrees of resistance to frost injury depending on the variety. Some of the canes mentioned are resistant in both leaf and stalk, some susceptible in the leaf but of fair to good stalk resistance and others shewing the opposite relationship, and finally those susceptible to injury in both leaf and stalk.
730. 633.61.00.14(54.7)
Annual Report of the Sugarcane Research Scheme, Bombay-Deccan, Padegaon, 1933-34.
 Government of India Press, New Delhi, 1935 : Pp. 106.
 The results of the preliminary, intermediate and final variety trials carried out during the year under review are given ; no conclusions are drawn but certain indications are recorded, e.g. that Coimbatore selections tend to do well when the soils are new.
 The cane-sorghum hybrids from Coimbatore have been tested in preliminary trials for ripening period.
731. McINTOSH, A. E. S. and FOSTER, C. B. 633.61.00.14(72.98)
An account of the methods employed in carrying out sugar cane seedling and variety trials in Barbados.
 Bull. B.W.I. Cent. Sug. Cane Breed. Sta. 1935 : No. 9 : 21-24.
 The practical details of carrying out variety trials are described, including the choice of site, the precautions to ensure a full stand and the disposition of labour in planting and reaping.

STIMULANTS 633.7

732. SINGH, B. N. and CHOUDHRI, R. S. 633.71:575.243:537.531
Induced morphological, physiological and chemical variations following seed-exposure to X-radiation in *Nicotiana Tabacum*.
 Proc. Indian Acad. Sci. 1935 : 1 : Sect. B. 435-51.
 The effects of X-rays on seeds in the dry state and therefore capable of standing long distance transport for sowing on a large scale were tested by subjecting two lots of seeds of a pure strain of *Nicotiana Tabacum*, as uniform as possible in size and weight, to minute doses of X-rays. A maximum interval of 10 days was allowed to elapse after treatment and the two lots were then sown together.
 The results shewed *inter alia* an increase in plant height, ramification of the root system, size of flowers, and in leaf and grain yield. Moreover the quality of the seed from the irradiated plants as estimated by its relative density, absolute weight and volume weight was improved.
 Mention is made of the possibility of obtaining high yielding fixed types by such treatment in view of the uniform occurrence of the altered phenotype in F₂. Similar effects were observed in the group sown 10 days after treatment, which suggests that the process might be used where seeds had to be transported some distance.

733. MAHER, A. C. 633.73:575(67.62)

Importance of variety trials with coffee.

Mon. Bull. Coffee Bd. Kenya 1935 : 1 : No. 8 : 14-15.

Some of the better known varieties of *Coffea arabica* are briefly described. The improvements needed are higher yielding ability, better liquoring quality, bigger beans, more vigorous growth, more disease resistance and more drought resistance.

Three methods by which improvement may be brought about are the introduction of well-known varieties from other coffee-growing countries, a search for better types in the plantation and a search for new types in the original habitat of the coffee plant i.e. in south west Abyssinia.

In connexion with the last method it is mentioned that coffee grown from seed sent from Harrar is shewing great promise for the drier part of Kenya, while seed has been obtained from Amfillo where the rainfall is 85" and it is hoped that this seed will produce plants of value to the moister, up-country coffee districts.

734. GILBERT, S. M. 633.73:575.42(67.8)

Individual tree records of *Coffea arabica*.

Mon. Bull. Coffee Bd. Kenya 1935 : 1 : No. 9 : 10-12.

The value of individual tree records both to the experimenter and to the planter is explained and illustrated with reference to other perennial crops.

The taking of such records is part of the work of the Tanganyika Coffee Research and Experimental Station, Lyamungu and the material collected shews that very great variation exists in *Coffea arabica* in Tanganyika. Though the problem of environmental influences still needs investigation, this variation indicates the value of selection in improving the crop. Vegetative methods of propagation are being perfected and the question of reproduction by seedlings, whether by self or cross-pollination of good trees is also being considered.

735. THOMAS, A. S. 633.73:575.42:581.162.5(67.61)

Types of Robusta coffee and their selection in Uganda.

E. Afr. Agric. J. 1935 : 1 : 193-97.

The native Robusta coffee (*Coffea canephora* Pierre) of Uganda, known as Nganda, has several advantages over the Java types, chiefly arising from its spreading habit and little need of pruning. Efforts are being made to improve Nganda coffee by selection on a basis of vigour, including resistance to disease, yield and size of bean. Liquoring quality appears to be more dependent on the method of preparation than on genetical factors.

Mother trees not under 10 years of age are selected and their progeny tested in progeny rows. This work is sometimes assisted by the discovery on native farms of plots of coffee which are the progeny of one tree, a considerable amount of selection having been practised by the natives.

It has been found that a set of fruit ranging from 6 to 45 per cent can be obtained by self-pollination. This result, which differs considerably from the average of 0.5 per cent obtained in Java, will be of great assistance in breeding work. Java strains are also being tested to see if they will prove more self-fertile in Uganda.

736. McDONALD, J. 633.73-2-1.521.6

Progress report on coffee berry disease.

Mon. Bull. Coffee Bd. Kenya 1935 : 1 (11) : 10-11.

Varietal differences in susceptibility are reported, bushes with the true Mysore characteristics being definitely resistant.

737. 633.73-2-1.521.6:575

Report of committee on coffee berry disease.

Bull. Dep. Agric. Kenya 1934 : No. 3 : Pp. 20.

The programme drawn up by the Coffee Berry Disease Committee included the observations on existing supposedly resistant varieties, the building up of resistant plantations by vegetative propagation from resistant trees and by top working material from resistant on the present non-resisting stocks.

Data shew that Blue Mountain coffee trees are and have for many years proved very resistant to the disease, while the Mocha type may be very severely attacked, though resistant individuals are also found in this variety. Resistant trees and varieties have been selected and used for grafting purposes.

A warning is given to select for propagation only those trees which are free from brown blight (*Colletotrichum coffeanum*) as well as coffee berry disease since they are frequently found associated. A study of flower abortion is also suggested.

738. THOROLD, C. A. 633.73-2.8-1.521.6
Progress report on Elgon Dieback of coffee.
 Mon. Bull. Coffee Bd. Kenya 1935 : 1 : 10-11.

Though this disease is of unknown origin observations on about 300 trees since 1934 have revealed resistant and immune types, one in particular, a copper tip French Mission coffee, being remarkable in this respect.

739. POUND, F. J. 633.74-1.557
Efficiency in the cacao field with spécial reference to replacement of poor bearers.
 Proc. Agric. Soc. Trin. Tob. 1935 : 35 : 385-90.

Productive efficiency of a cacao plantation can be ensured by selection of trees based on certain requirements as regards the size of beans, the number of pods to the pound, and potential yield per acre. The application of such standards, combined with a policy of substituting for inferior trees young and vigorous ones, has been tested in a replacement experiment at River Estate, Trinidad, in which 50 per cent of the trees in the experiment field were gradually replaced and in 15 years the yield had risen from 18,000 pods to 27,000 pods.

Soil improvement and the economic aspect of Criollo cultivation are also discussed.

740. HOPKINS, R. H. and NORRIS, F. W. 633.79:575(42)
The fermentation industries.
 Rep. Ferment. Industr., Lond. 1935 : Pp. 33.

Contains a survey of the work already reviewed in "Plant Breeding Abstracts," Vol. VI, Abst. 388.

CAPSICUM 633.842

741. DESHPANDE, R. B. 633.842:664.5:575
Studies in Indian chillies. (4) Inheritance of pungency in *Capsicum annum* L.
 Indian J. Agric. Sci. 1935 : 5 : 513-16.

A cross between the pungent Pusa Type 29 and the non-pungent Type 14 was studied. Pungency was found to be partially dominant in F_1 . The F_2 and F_3 were classified broadly into pungent and non-pungent groups by tasting the fruits. The 3 : 1 ratio obtained in F_2 was confirmed in F_3 , although it is stated that various degrees of pungency were suspected. A factor *C* is assumed to be responsible for the production of pungency.

Inheritance of pungency was found to be independent of the nature of the calyx (i.e. enclosing or not enclosing the fruit-base).

B. P.P.

742. DESHPANDE, R. B. 633.842:664.5:575
Pungency in chillies (*Capsicum annum*): A Mendelian character.
 Curr. Sci. 1935 : 4 : p. 418.

A correction in which the writer draws attention to his earlier and recent studies (Cf. Abst. 741) on pungency in *Capsicum annum*, which were apparently overlooked in the article reviewed in "Plant Breeding Abstracts" Vol. VI, Abst. 389.

OIL PLANTS 633.85

743. PATEL, J. S. and NARAYANA, G. V. 633.854.797:576.312.35
Chromosome numbers in Safflower—*Carthamus tinctorius*, Linn.
 Curr. Sci. 1935 : 4 : p. 412.
 GREGORY, P. J.
Chromosome numbers in Safflower—*Carthamus tinctorius*, Linn. Reply.
 Curr. Sci. 1935 : 4 : p. 412.

The somatic number of chromosomes in *C. tinctorius* has been recorded by Gregory as 20 for Coimbatore types and 24 for Pusa types. Patel and Narayana have also found $2n = 24$ and $n = 12$ in the Pusa type.

FRUIT TREES 634

744. DAVIS, M. B. 634.11-2.111-1.521.6(71)
Hardiness of commercial varieties of apples.
 41st Annu. Rep. Pomol. Soc. Quebec 1934 : 40-41.

A survey of the behaviour of varieties in the severe winter of 1933-34 indicated that McIntosh will continue to be the main variety in Canada ; Lobo, which is harder than McIntosh, may replace Wealthy and Fameuse, while among the early apples Melba still appears to be the best. The author suggests that winter injury, in particular crotch injury and sunscald, might be avoided by top-working desirable varieties on a very winter-hardy variety such as Antonovka.

745. BLAIR, D. S. 634.11-2.111-1.521.6(71.3)
Winter injury—Central Experimental Farm, Ottawa 1933-34.
 41st Annu. Rep. Pomol. Soc. Quebec 1934 : 24-29.

The extent and nature of winter injury to apple varieties at the Central Experimental Farm, Ottawa in the severe winter of 1933-34 are described. In general the maturity of the wood at the time of the early frosts in November had a great influence on the degree of hardiness. The late summer varieties were for the most part hardy, the autumn to mid-winter varieties had only a fair degree of hardiness, while the mid-winter to late winter varieties had little or no hardiness. Statistical studies in the root stock orchard shewed that no effect of root stock on the hardiness of the scion variety could be detected.

The Russian varieties for the most part shewed little injury and certain of them were not injured at all.

Complete freedom from injury was also noted in certain of the hybrid varieties bred for hardiness for the Canadian Northwest (Cf. Abst. 747).

746. BROWNE, F. S. 634.11-2.111-1.521.6(71.4)
Winter hardiness of apple varieties.
 41st Annu. Rep. Pomol. Soc. Quebec 1934 : 19-21.

The winter hardiness of certain newer apple varieties at the Dominion Experimental Station, Lennoxville, Quebec is described. The most outstanding variety in this respect was Lobo. The varieties Melba, Joyce, Hume, Linda and Lawfam, while less hardy than Lobo, have all proved much harder than McIntosh.

747. BLAIR, D. S. 634.11-2.111-1.521.6:575(71)
Winter injury to apple trees in Eastern Canada 1933-35.
 Sci. Agric. 1935 : 16 : 8-15.

A report is given of a statistical study of winter injury made at Ottawa of 558 four-year-old apple trees representing 13 varieties. Judged by winterhardiness, among the commercial varieties in Canada Melba takes first place among the early apples, while McIntosh will continue to be the main variety. Wealthy and Fameuse may be replaced by Lobo owing to its great hardiness.

In a short historical note on the breeding of hardy apples at Ottawa Central Experimental Farm, it is explained that the original crosses were between the Siberian crab ♀ and commercial

varieties such as McIntosh, Duchess, etc., the hybrids being repeatedly crossed with similar commercial varieties. Up to the present 91 out of 615 third crosses have come into bearing and of these 10 are extremely hardy, and will probably be of high commercial value. Several are of good eating quality and appear to keep well. The apples from a Duchess x Wapella cross yields apples up to $3\frac{1}{4}$ inches in diameter.

748. JOACHIM, A. W. R. 634.61-1.421:519.24

A uniformity trial with coconuts.

Trop. Agriculturist 1935 : 85 : 198-207.

In a uniformity trial at Wariyapola with local control by randomized blocks, applying Fisher's analysis of variance, it was found that under the conditions of the area a plot of 18 or 20 trees is the optimum for field experiments with this crop, a result agreeing with that obtained at Bandirippuwa.

With 18-tree plots six replications would be needed for treatment differences of about 15 per cent to be considered significant.

749. 634.651:577.88

HAIGH, J. C. and FERNANDO, W. N.

634.651-1.557:575(54.8)

A note on the planting of papaws.

Trop. Agriculturist 1935 : 85 : 387-89.

At the Experiment Station, Peradeniya a plantation of the commercial (papain) variety of papaya has been laid out according to the plan referred to in "Plant Breeding Abstracts" Vol. III, Abst. 579 and high yielding trees are ultimately to be selected after test tappings of the individual trees.

The resultant number of male and female trees obtained by this system of planting was reasonably close to the theoretical expectations if hermaphrodite trees were regarded as male. Also the ratio of ♂ to ♀ plants was 265 ♂ or ♀ : 239 ♀ which is not far removed from a 1 : 1 ratio.

The observations taken up to the present have shewn that both flower and tree types range from completely male to completely female, although as regards the trees other intermediate types may exist though not represented in the Station plot.

750. HAIGH, J. C. 634.651-1.557:575

The improvement of papaw by selection.

Trop. Agriculturist 1935 : 85 : 390-93.

A preliminary report of work in progress with the objects of firstly improving the papain content of the fruit in general and secondly selecting a variety combining with a high papain content high proteolytic activity of the product. Collections of types of papaya are being made for subsequent comparison of their papain content. Selections for yield are at present being made from the commonly grown type.

Though the results are not complete they indicate that the test block of 275 trees tapped for latex contains some definitely above the average as regards yield. Moreover, since it would seem that the yield of a tree is primarily controlled by the number of its fruits and to a lesser extent by the yield per fruit and also that yield per fruit is independent of the number of fruits, hence it should be possible to combine a high number of fruits per tree with high yielding fruits.

751. 634.836.72:575(94)

634.844.1.09

634.851.09

CASTELLA, F. de

634.843.6.09

Phylloxera-resistant vine stocks. (II and III). Including some recent introductions.

J. Dep. Agric. Vict. 1935 : 33 : 512-21 ; 567-74 ; 576.

In continuation of the previous paper (Cf. "Plant Breeding Abstracts," Vol. VI, Abst. 79) various groups of hybrids between *V. Berlandieri* and *V. rupestris* and between *V. vinifera* and *V. Berlandieri*, complex *Berlandieri* hybrids and a number of hybrids of *V. cordifolia* are discussed.

FORESTRY 634.9

752.

634.95(016)

Forest bibliography with the index number 634.9F. An international decimal classification on the basis of Melvil Dewey's system. Adopted on the recommendation of the International Committee on Forest Bibliography, 1906-1933.

Int. Un. For. Res. Organiza. Oxford 1936 : Pp. vii + 100.

The English translation of the publication reviewed in "Plant Breeding Abstracts," Vol. V, p. 377.

753.

BALCH, R. E.

634.975-2.7-1.521.6:575.42

Cultural practices and forest insects.

65th Annu. Rep. Ent. Soc. Ont. 1935 : 43-49.

It is mentioned that instances of individual trees proving resistant to insect attack have been noted e.g. a young balsam fir on Cape Breton Island was practically untouched by black-headed budworm though surrounding trees were almost defoliated. This and other cases reported in the literature suggest the possibility of selecting resistant trees by saving seed from such immune types.

VEGETABLES 635

754.

GAUT, R. C.

635.31.00.14

Asparagus "strain" trial.

Worcs. Agric. Quart. Chron. 1934 : 2 : 289-95.

GAUT, R. C. and HOBBS, E. W.

Asparagus "strain" trials.

Worcs. Agric. Quart. Chron. 1935 : 4 : 21-33.

635.31-1.557:577.81

In trials of strains obtained from selected plants from cross-pollinations made in 1928 considerable variation was seen in the production of marketable buds.

Male and female plants were also tested for productivity and it was concluded that from existing evidence, male plants, as compared with the females, apparently produce about 90 per cent more buds and a 70 per cent greater yield but female plants bear larger buds on the average than the male plants.

Observations taken for six seasons offered no evidence of change of sex in asparagus plants. The ratio appeared to be approximately 1 : 1.

Part II. Foreign.

STATISTICS 519

755. WAHLUND, S. 519.241
A new method of determining correlation from tetrachoric groupings.
 Lantbruks-högskolans Annaler 1935 : 2 : 181-244.

The author considers the problem of the measurement of association between the attributes in the four-fold table. After reviewing the literature on the subject the conclusion is reached that Pearson's tetrachoric coefficient of correlation is the best expression of the relationship. Its only drawback is the labour involved in calculation. The author, however, is able to derive certain trigonometric measures as approximate values of the tetrachoric correlation, and he explains, with a numerical illustration, how the calculation is carried out. The necessary tables are provided. Various methods of calculating association, including the author's own, are illustrated on twelve examples given by Pearson in 1931. J. W.

756. WAUGH, F. V. 519.241
A simplified method of determining multiple regression constants.
 J. Amer. Statist. Ass. 1935 : 30 : 694-700.

A method of calculating partial regression coefficients which does not at the same time provide the necessary machinery for the calculation of partial and multiple correlation coefficients, and of standard errors, can hardly be said to be complete. With a considerable number of variates the complete calculations are laborious, which makes it desirable so to systematize the methods that the computations become automatic in character. In this paper the author describes a modification of a method on the Doolittle plan, attributed to Horst, which gives all that is required in the shortest possible time. As a set of instructions governing the computation of multiple regression constants, this material is in use in the United States Bureau of Agricultural Economics. It is illustrated in the paper by means of an actual example. J. W.

757. ROBERTY, G. 519.241.6:575.42
 Probabilités et sélection. (**Probabilities and selection**).
 Rev. Bot. Appl. 1935 : 15 : 215-22.

A simple method for the use of the standard deviation in testing the significance of variations in breeding material is given, with a hypothetical example of its use in connexion with several characters.

GENETICS 575

758. HAYES, H. K. 575:633
Green pastures for the plant breeder.
 J. Amer. Soc. Agron. 1935 : 27 : 957-62.

In this address delivered to the American Society of Agronomy the progress in breeding rust-resistant spring wheats and hybrid maize are briefly described and the room for improvement is mentioned. The value of co-operation in research is stressed. Mention is also made of breeding problems in grasses which so far have obtained little attention in the United States.

759. 575:633(47)
(Work of the Department of Genetics of the Institute of Plant Industry).
 Semenovodstvo (Seed Growing) 1935 : No. 8 : 38-39.

A very brief outline of the achievements in plant breeding of the Leningrad Institute of Plant Industry. Most of the results have already been reviewed in "Plant Breeding Abstracts;" special mention is made of a method of determining the fibre content of flax anatomically, thus being suitable for very small quantities of material, of similar anatomical determinations of the cold resistance and earliness in potatoes and wheat and possibly also of lodging resistance in cereals. Quite high yielding potato hybrids resistant to blight (*Phytophthora infestans*) have been obtained, together with resistant forms of a number of other crops.

760.

MEISTER, G. K.

575:633(47)

633.11:575.127

(Soviet breeding, its achievements and prospects).

Sotsialističeskaja Rekonstruktsija Sel'skogo Khozjaistva (Socialist Reconstruction of Agriculture) 1935 : No. 12 (6) : 138-47.

Brief descriptions are given of all the main new successful varieties of wheats produced in the Soviet Union, with indications of their good qualities and chief defects. The problems that still await solution in the different zones are analysed, for example in the arid zone the introduction of resistance to rust, smut and the sawfly into the drought-resistant varieties, and resistance to smut and bunt in the forest steppe zone, combined if possible with resistance to frit fly and to lodging in good years. A further line of breeding recommended is the production of lines with the maximum capacity for utilizing the available manurial and water supplies, a question that has received too little attention hitherto. Combined with this, for northern zones improved standing capacity, earliness, cold resistance, immunity to *Fusarium* and freedom from sprouting are necessary.

The improvement of baking quality is mentioned as one of the fields in which Soviet breeders are most backward and in which improvements must be introduced.

In connexion with disease resistance great hope is centred in the new wheat *Triticum Timopheevi*. Direct crosses with *T. vulgare* have so far proved unsuccessful but D. Kostov has made this combination successfully by his method of triple genom hybridization. *T. Timopheevi*, having two genomes, was first crossed with *T. monococcum*, with one genom. From this was obtained a fertile amphidiploid with three genomes which crossed with the three-genom *T. vulgare* and gave fertile hybrids. Altogether the method of distant hybridization has been used much more extensively and successfully in the Soviet Union than elsewhere. For instance the variety Sarrubra, produced from crosses of *T. durum* with *T. vulgare*, combines an exceptionally high grain quality with awnlessness and freedom from shattering and in the current year over 300,000 ha. were sown under this variety. Some of the wheat-rye hybrids are showing great promise on account of their extreme winter-hardiness and capacity for growing on poor land. It is thought not improbable that the solution of the problem of winter-hardiness, and of disease resistance too, may be found in the hybrids of wheat with *Agropyrum*, of which moreover constant perennial forms are now available at Saratov. A strong recommendation is made that more extensive studies should be made on these hybrids.

In discussing the method of crossing distant geographical races recommended by Vavilov and others, the author advises breeders not to resort to these if their problem can be solved by crossing more closely allied varieties, owing to the many difficulties and complications frequently associated with more distant crosses. It is pointed out for instance that the variation among the local varieties in Russia is so great as to provide many of the possibilities of a distant geographical cross without the attendant complexities.

As regards *T. durum*, before this will be a really successful crop it must be made more drought-resistant, earlier and more productive. It is thought that Lysenko's method of choosing parents would probably be a means of attaining greater earliness.

761.

FRANDSEN, H. N.

575:633(48.9)

Improvement, breeding and experiments with varieties and strains of agricultural plants.

Denmark Agriculture 1935 : 127-44.

The history and organization of plant breeding and seed distribution and testing in Denmark are described.

Plant breeding, which is chiefly concerned with cereals, root crops, grasses and clover, is carried on mainly by private organizations and began its development about the turn of the century. Many achievements in the form of improved varieties of different crops are mentioned.

762.

SIRKS, M. J.

575:633(49.2)

575:633(92)

Botany in the Netherlands (Edited for the Organizing Committee of the Sixth International Botanical Congress).

E. J. Brill, Leiden 1935 : Pp. vii + 140.

Brief descriptions of the history, functions and work of the institutions, societies, universities, experiment stations, etc. connected with botanical research in Holland and in the Dutch colonies are given.

Of interest to plant breeders among the universities may be mentioned the Government University at Groningen where the first Chair of Genetics in Holland was instituted in 1919, and the University College of Agriculture at Wageningen which has both a laboratory of genetics and an institute of plant breeding.

Among the autonomous institutions the Government Phytopathological Service, Wageningen concerns itself *inter alia* with the examination of potato varieties and seedlings for susceptibility to black scab and for the determination of varieties. In connexion with seed testing there is the Government Seed Testing Station at Wageningen while the Netherlands General Inspection Service, also at Wageningen, inspects both seeds and mature plants. Variety trials are held in different parts by the Agricultural Experiment Fields Service, Wageningen.

The importance of plant breeding in the Dutch East Indies is well-known. The following institutions are mentioned as concerned in plant breeding : the General Agricultural Experiment Station, Buitenzorg, Java (*Citrus*, kapok, groundnuts, potatoes, maize, rice, derris, coconut, etc.) ; the Deli Experiment Station, Medan, Deli, Sumatra (tobacco) ; the Experiment Station for Vorstenlanden Tobacco, Klaten, Java where much tobacco breeding has been done, including the production of a bright-leaved form as a mutant induced by X-rays ; the Experiment Station of the Society of Rubber Growers on the East Coast of Sumatra (A.V.R.O.S.), Medan, Sumatra where selection and breeding is in progress with *Hevea* ; the Agricultural Department of the Java Sugar Experiment Station, Pasoeroean, Java, where P.O.J. cane varieties are bred ; the Experiment Station at Besoekei (selection and breeding in coffee, *Hevea* and tobacco) ; the Experiment Station West Java, Buitenzorg, Java (selection in *Hevea* and tea) ; and lastly the Experiment Station Middle and East Java, Malang, Java which carries on selection in coffee and cacao.

763.

Boss, A.

575:633(77.6)

Minnesota Agricultural Experiment Station 1885-1935.

Bull. Minn. Agric. Exp. Sta. 1935 : No. 319 : Pp. 78.

An account is given of the history and activities of the station. Plant breeding work has been carried on since as early as 1888, the chief crops worked on being cereals, flax, forage plants, bush and tree fruits, potatoes and other horticultural plants.

The plant pathology division established in 1908 has done a good deal of work on the genetics of parasitic fungi and co-operated with plant geneticists in producing disease resistant varieties of flax, wheat, barley and maize.

Breeding work with different crops is also performed at the different branch stations.

764.

BRIGGS, F. N.

575:633:575.12

The backcross method in plant breeding.

J. Amer. Soc. Agron. 1935 : 27 : 971-73.

In emphasizing the value of the method of repeated back-crossing, particularly in transferring specific characters from one form to another, the author brings forward theoretically derived figures to shew how much greater are the chances of recovering the parental form in this way than by inbreeding the hybrid.

The method is particularly useful in adding disease and insect resistance to standard varieties. When it is desired to add resistance to two different diseases, separate programmes should be mapped out for each disease and the end products crossed together.

765.

575:633:578.08

575.148:575.12

581.143.26.03

MEISTER, G.

(Some critical remarks).

Selektsija i Semenovodstvo (Breeding and Seed Growing) 1935 : 2/10 : 13-17.

LYSENKO, T. D.

(Reply to the article "Some critical remarks" by G. K. Meister).

Selektsija i Semenovodstvo (Breeding and Seed Growing) 1935 : 2/10 : 21-30.

In analysing some of the remarks made by Lysenko and Prezent in a recent book the critic points out that these two writers entirely ignore a large body of important achievements in plant genetics and by their criticism of genetical theory and method often display complete ignorance of the modern developments in these lines. Examples are quoted ; e.g. the supposition that the limits of earliness of the progeny of a cross can be judged by the F_1 ; and the statement is made that a pure line will degenerate before it is put on the market and that no self-pollinated plant will remain pure for 30-35 years—the critic however pointed out that with the rapid improvement of varieties it is seldom required to keep the same variety for as long as 30-50 years, but that Marquis and other varieties have remained pure for over 30 years and some English wheat varieties for over 100 years. The plants referred to by Lysenko as having been selected from a pure line *lutescens* 062 and having maturing dates five days earlier and later than the average for the line, are considered by Professor Meister to be either hybrids or mechanical admixtures ; he has made observations on this line continuously since 1911 and found no indications of degeneration ; figures are given shewing its yield to have remained unimpaired during the period 1915 to 1934. Moreover in 1915 crosses were made between different lines of 062 and the population obtained from this cross shewed no variation in either one direction or the other. This provides a palpable proof, if any were needed, of the fallaciousness of the "marriage for love" method proposed by Lysenko and Prezent for preventing degeneration in a pure line and consisting of crossing plants within the line among themselves. (See Abst. 771 below).

The method of inbreeding similarly, though it has not proved a success in most cases, may be very valuable for certain purposes and certainly cannot be dismissed entirely as is done by Lysenko. The breeding method put forward by Lysenko is admitted to be one of great practical importance but the author insists that it represents only one of many aspects of an extremely complex problem.

In justifying his method of crossing within a variety Lysenko states that at the worst the product will be identical with uncrossed plants and yet there will be always the chance that by introduction of new "blood" an improvement may be effected in vigour, health, earliness or some other such characters. Comparisons were made of fruits obtained by cross-pollinating neighbouring plants of the same variety and of fruits from the same plant by ordinary self-pollination in tomatoes. The seeds were sown and the resulting plants compared. Clear differences are reported in favour of the crossed plants in respect of vigour of growth in certain cases, and no case of inferiority was observed.

It is pointed out that in the experiment described by Meister the 062 plants used were only four generations removed from the original strain obtained by individual plant selection from Poltavka and that if the 062 of to-day were taken, or one plant from Saratov and others from some other district, quite different results might be expected. The possibility of absolute homozygosity is denied and it is claimed that variation may arise in an apparently pure line by simple segregation, since it is humanly impossible to obtain homozygosity in all the thousands of characters which go to form any given organism. It is as a result of this segregation that a variety changes in the course of a number of years and the original variety can only be restored by crossing a number of the segregating lines among themselves. As an illustration it is supposed that one such segregate has lost the vigour of its root system, another its resistance to certain unfavourable climatic conditions, though externally the two plants may be identical. By inter-crossing them a line may be produced which is deficient in neither of the two features. Or one line may be inferior owing to a low osmotic pressure in the roots and another line owing to

some other deficiency. Many complementary types may be found which, both inferior in some different respect, on crossing give lines superior to both.

Sowings have been made of seed of a number of the highest quality wheats in the autumn after vernalization. The majority of them perished during the winter owing to the reduced cold resistance resultant upon vernalization. Some few however survived and of these only those that matured with or earlier than Kooperatorka and Ukrainka were retained. In this way it is hoped to be able to select cold resistant early maturing forms of these high quality wheats; the early forms are usually also drought-resistant, so that in this way a combination of desirable features will be obtained which by the ordinary methods of breeding would be very difficult of achievement. Similarly with respect to vegetative period, it is claimed that by the method of choosing parents according to their phasic behaviour (Cf. "Plant Breeding Abstracts," Vol. V, Abst. 638 and VI, p. 329*) a new variety maturing at any given date can be produced in as little as two-and-a-half years and by the use of infinitely less material than by the common method of breeding. In Lysenko's method all plants not fulfilling the requirements of date of maturity are discarded at once, without even bringing them to purity; thus certain combinations have been entirely discarded as soon as the F_1 was examined.

A heterozygous plant, it is stated, is more capable of adaptation to environmental conditions than a homozygote and for this reason it is thought desirable that varieties should be kept "relatively heterozygous" in all characters other than external morphology and the characters affecting quality. The proposed method of crossing within the variety is a means of maintaining this heterozygosity. For the same reason the application of inbreeding in cross-fertilized plants is discountenanced, on the grounds that it reduces the adaptability of the variety to possible climatic changes. Only for plants grown under strictly controlled conditions where such changes can not occur, as in the case of horticultural plants grown under glass, is the method admitted to be of possible value in the production of useful recessive forms. Maize is cited as an example of the failure of inbreeding in that after thirty years of work no agronomically valuable inbred variety has been produced.

766. SVIRSKII, Ja. P.

575:633:578.08

(Methods of accelerating breeding).

Semenovodstvo (Seed Growing) 1935: No. 8: 32-33.

In growing an F_2 population of limited size many recessive combinations do not occur and only appear in later generations, perhaps not till F_7 or F_8 , and sometimes not at all. It is obviously therefore desirable to have as large a number of individuals in F_2 as possible, which can be achieved by increasing the number of crosses made in each combination, and obtaining as many seeds as possible from the F_1 plants. For this reason the F_1 plants should be widely spaced and well manured, artificial manures being applied in the form of solutions. Some plants can also be transplanted and some vegetatively propagated; the alkaloid-free lupins have been multiplied very successfully by cuttings. By the application of these methods as many as 2,000 seeds have been obtained from one F_1 plant in lupins and barley, and 1,500 in vetch.

767. KRASOČKIN, V.

575:633:578.081

(The refractometer in breeding root crops).

Selektsija i Semenovodstvo (Breeding and Seed Growing) 1935: 2/10: 67-73.

Reasons are given for regarding the dry matter content as quite as important as the total yield in root crops and vegetables, though it is a point largely overlooked by the majority of European breeding firms. The use of the refractometer for this purpose is described; the instrument is shown to be more suited for application in breeding work than a number of other similar devices and the grounds for this conclusion are enumerated. Chief among these are its accuracy, its applicability to small quantities, simplicity and rapidity.

* "Vernalization and Phasic Development of Plants," published by the Imperial Bureau of Plant Genetics, December, 1935.

768. YU, T. F. 575:633-2
(Plant pathology and plant breeding).

Proc. 1st Pl. Breed. Conf. China (1934) 1935 : 58-59.

The importance of combating plant disease by breeding was emphasized ; also the difficulties encountered in breeding for disease resistance were pointed out, e.g., the occurrence of physiological forms ; of resistance to one disease combined with susceptibility to others ; and the absence of established correlations in morphological characters of crop plants between resistance to certain diseases. Lastly the importance of close cooperation between plant pathologists and plant breeders was stressed and an attempt was made to indicate the line of demarcation between their respective spheres in breeding for disease resistance.

P. C. M.

769. OEHLKERS, F. 575.1
 575
 Vererbung. I. Allgemeine Vererbungslehre. II. Spezielle Vererbungslehre.
 Die Erbllichkeit im Bereich der Blüte. (**Inheritance. I. Genetics—general.**
II. Genetics—special. Inheritance of features relating to the flower.)
 Fortschr. Bot., Berl. 1935 : 4 : 274-93.

A further annual survey of genetic research in which the previous year's account of investigations (Cf. " Plant Breeding Abstracts " Vol. IV, Abst. 602) on mutation, inheritance in polyploids and the nature of the variants produced by mutation following irradiation occupies the first part of the paper.

Relevant literature has already been reviewed in " Plant Breeding Abstracts."

Part II deals with experimental results obtained from plants not of economic importance.

770. STERN, C. 575.1:575.31
 575.17
Genetics and ontogeny.
 Amer. Nat. 1936 : 70 : 29-35.

In considering the problem of ontogeny in relation to genetics we have to study the complex of genes plus plasma and it is the reaction of the genes with their immediate surroundings which conditions ontogenetic development. In this connexion the concept of the role of genes in influencing the velocities of hypothetical reactions which lead to the formation of substances taking part in determination processes is mentioned.

It is considered that the idea of a gene having a definite " time of action in ontogeny " is erroneous ; the genes must be considered as operating always, the timing of specific effects being a property of the interacting complex rather than of the gene itself.

There is evidence that genes, at least in some instances, exert their influence during the resting stage of the nucleus.

771. KOZLOV, M. and MATVEEV, N. 575.148:575.12
 575:633:578.08
(Is it necessary to regenerate varieties ?).

Selektisija i Semenovodstvo (Breeding and Seed Growing) 1935 : 2/10 : 17-20.

Lysenko has proposed a method for the " rejuvenation " of varieties consisting of crossing lines within the variety *inter se*, on the premise that inbreeding is the cause of the " degeneration " which, he affirms, invariably occurs in pure lines ; the method proposed consists in pollinating a plant of one variety with a mixture of pollen from a number of different plants of the same variety, in order to " enrich " the plant in its stock of genes. The egg cell is supposed to exert a selective action upon these pollen grains and the method is therefore referred to by Lysenko as " marriage by love." He recommends making the crosses three years before the seeds are required for sowing so as to give time to multiply a sufficient quantity for sowing : it is therefore clear that there can be no question of heterosis playing a part since this is known to have largely disappeared by the third and later generations. If the method were to have any justifiable basis it would be necessary for the line to be heterogeneous, which could come about in one of three ways, mechanical impurity, cross-pollination or mutation. Even still, the fact that the

selection is left to nature must constitute a serious defect in the method, since this must necessarily reduce the chances of obtaining a product possessing agronomically desirable features in addition to the necessary adaptation to local conditions. The production of new varieties that represent a real improvement on existing forms is, it is pointed out, a matter of some complexity and it is doubtful whether a method such as that proposed by Lysenko, whereby farmers improve their own crops, will ever be satisfactory. In fact the great advantage of the Soviet system is that the task of supplying stocks of pure and improved seeds is planned and organized on a state basis and not according to the slogan "each man his own plant breeder."

772. MICHAELIS, P. 575.182
 Untersuchungen zum Problem der Plasmavererbung. (**Investigations on the problem of cytoplasmic inheritance**).
 Z. indukt. Abstamm. -u. VererbLehre 1935 : 70 : 537-38.

Further work on cytoplasmic inheritance (Cf. "Plant Breeding Abstracts," Vol. V, Abst. 600) from experiments on *Epilobium* shewed that the cytoplasm affects not only gene quality but also quantity and that it is of importance for physiological development as well as genetically.

773. KAMSCHILOW, M. M. 575.22
 (**Phenotypical variability in biotypes and populations**).
 Biologičeskii Z. (J. de Biol.) 1935 : 4 : 385-400.

The variation in a population is governed by the phenotypical (modification) variability of the individual biotypes composing it and the genotypic variability of the lines comprising the population. A new formula is derived for calculating this total variation, which is as follows :—
 $\sigma_g^2 = M_g^2 + \sigma_v^2 + \sigma^2 M$,
 where $\sigma_v^2 + \sigma^2 M = \sigma^2 g$ is the phenotypic expression of the genotypical variability of the population σM_g being the mean modification variability.

The phenotypical expression of an identical genotypical variation may however be different in different environments, e.g. in different years or at different ages of a given set of individuals. The bearing of this on selection is discussed : it is evident that selection will be most efficient when carried out under those conditions in which the maximum phenotypic expression of a given genotypical variability is observed. Experimental proof of this is given. In order to find the most suitable conditions the variability must therefore be studied under a number of different conditions and at different ages. In view of this reasoning the formula for the genotypical variability of the population is still further modified, each phenotypic value being made a function also of the conditions of environment.

774. GERASSIMOVA, H. 575.24:576.356.2:581.01
 The nature and causes of mutations. II. Transmission of mutations arising in aged seeds : occurrence of "homozygous dislocants" among progeny of plants raised from aged seeds.
 Cytologia, Tokyo 1935 : 6 : 431-37.

Seeds resulting from open-pollination were gathered from plants of *Crepis tectorum* L. which were grown from seeds aged for seven years in a previous investigation (see "Plant Breeding Abstracts" Vol. III, Abst. 552). In the next generation thus produced, many defective plants appeared and also plants shewing different degrees of sterility.

Out of 22 progenies examined, two contained chromosomal mutants ; in one of these progenies 5 out of 46 plants had one and 7 had two reorganized C-chromosomes while in the other progeny 16 plants had one reorganized A-chromosome and one had two. The change in the C-chromosomes was an inversion involving the spindle fibre attachment point, that in the A was a translocation of part of a distal portion to the distal end of a B-chromosome. Neither the heterozygous nor the homozygous chromosome mutants differed externally from their normal sibs to any noticeable extent ; the heterozygous forms shewed the expected amount of sterility while the homozygous forms were considerably more fertile, though still shewing a certain amount of sterility, possibly due to gene mutations.

The high proportion of cultures not shewing chromosomal mutations is correlated with the observation that such mutations are more frequent in the roots than in the shoots of plants from aged seeds. The occurrence of homozygous mutants indicates that such chromosomal mutations are transmitted through both pollen and ovules.

The evolution significance of the phenomenon lies in the physiological isolation produced thereby, as shewn by the sterility of the heterozygous mutants.

775. AVERY, A. G. and BLAKESLEE, A. F. 575.24:581.4.01

Visible mutations from aged seeds.

Amer. Nat. 1936 : 70 : 36-37. (Abst.)

In the progeny of 315 *Datura* plants from seeds which had been aged from 7 to 10 years 11 new morphological types due to mutation have been secured, as compared with 30 pollen abortion types previously found in the same 315 plants.

Thus the frequency of the mutations from aged seeds as shewn by visible morphological effects is about one third of that measured by pollen abortion, though still exceedingly high as compared with the frequency in untreated normal plants.

776. STUBBE, H. 575.243:537.531:575.182

Über den Einfluss artfremden Plasmas auf die Konstanz der Gene. (On the influence of the plasma of a foreign species on the constancy of the gene).

Z. indukt. Abstamm. -u. VererbLehre 1935 : 70 : 161-69.

The effect of the same doses of X-rays on the number of gene mutations of the nucleus of *Epilobium hirsutum* in its own and foreign (*E. luteum*) plasma was investigated to find out whether the foreign plasma had any influence on the mutability of the *hirsutum* nucleus.

The results shewed a marked increase in the mutation rate of the *hirsutum* genom and indicate that in questions of heredity, plasma and nucleus must be considered together and not as things apart.

777. SAVCHENKO, P. F. 575.243:537.531:633.35

(Cytological investigation of the progeny of the vetch *Vicia sativa* subjected to X-ray treatment.)

Bull. Appl. Bot. Leningrad 1935 : Ser. 2 (8) : 59-79.

Seeds were taken from 98 plants of a pure line of *Vicia sativa* subjected to an exposure of 90 minutes to X-rays, and 22 other plants receiving shorter doses of varying lengths, all the plants being irradiated at the age of 1-2 days. A cytological study was made of the plants of the first generation, some of which shewed differences in vigour of growth, seed formation, time of maturity and certain other characters. Data are first given of the exact dimensions of the chromosomes in the normal plant, examined by Levitsky's method. Similar data are then given for the X-rayed progeny. Out of 620 X-rayed F_1 plants, 19 (i.e. 3 per cent) shewed chromosomal aberrations; these appeared entirely in the progeny of the plants receiving the maximum dose of 90 minutes, corresponding to a total of 640 R. Several chromosomes shewed differences in length of one or both their arms, evidently as a result of translocation.

In the first generation all the cells in any one plant were identical, though different plants from the same X-rayed parent might be different owing to their having arisen from different sectors of the treated plant. Certain groups of sister F_1 plants from the same X-rayed parent proved to be more or less identical. They contained the same alteration in each member of the chromosome pair and were therefore "homozygous." These "homozygous" plants shewed very much reduced yields compared with the normal plants and even compared with the "heterozygotes," owing to their greater sterility. In one case the position of the attachment constriction had changed, possibly owing to a translocation from one end of the chromosome to the other. In another case there was translocation from one chromosome to its homologue. Chromosome fragments were also observed without attachment constrictions. There was one case of triploid cells. Most of these plants were morphologically quite normal.

Some plants however displayed pronounced morphological deviations without any cytological irregularities. One such plant with very much reduced vigour, branching, height, size of leaves and flowers, pale green leaves and delayed flowering, though it reached maturity eight days earlier than the normal, proved to be homozygous and gave 20 similar plants in the F_2 . Another unusually small, stocky, leafy plant with fully fertile pods, ripening seven days before the normal also proved homozygous.

The fact that aberrations only within certain limits occur shews that considerable selection is exercised upon the zygotes. In general, species with a large amount of chromatin material tolerate a greater amount of deviation than those with less (i.e. a small chromosome number). It is thought that the specific differences observed in the genus *Vicia* have arisen in nature by some process similar to the one observed in the X-rayed material.

778. CARTLEDGE, J. L., BARTON, L. C. and BLAKESLEE, A. F. 575.243:581.036

Temperature as a factor in the increased mutation rate.

Amer. Nat. 1936 : 70 : p. 43. (Abst.)

With seeds kept at a 5 per cent moisture level and treated at 75° C. for 24 to 28 hours or at 80° C. for 16 hours or with seeds at 7.5 per cent moisture content treated at 75° C. for 18 hours, about 5 per cent of mutations causing pollen abortion were obtained.

Thus high temperatures induce mutations of the same sort but at a lower rate than irradiation treatments or aging.

779. 575.243:581.331.2.01

CARTLEDGE, J. L., MURRAY, M. J. and BLAKESLEE, A. F.

Increased mutation rate from aged *Datura* pollen.

Proc. Nat. Acad. Sci. Wash. 1935 : 21 : 597-600.

Pollen of a very homozygous line of *Datura* was stored in an incubator at about 30°C. for periods of 2 to 20 days and then used to pollinate emasculated flowers of average age. Seeds were obtained when the pollen had been stored not longer than 13 days and in the 193 plants grown from these seeds a total of 29 pollen abortion mutations (Cf. "Plant Breeding Abstracts" Vol. IV, Abst. 610) were obtained while in 191 control plants from a self with fresh pollen no such mutations were obtained.

The percentage of mutations tended to increase with age and reduced viability of the pollen.

It is considered that this method of inducing mutations is of general application and also that it supports Navashin's suggestion (Cf. "Plant Breeding Abstracts," Vol. III, Abst. 552) that the cause of mutations induced by aging seeds lies in the metabolic conditions inside the cell rather than in external agents.

780. IMAI, Y.

575.25

The mechanism of bud variation.

Amer. Nat. 1935 : 69 : 587-95.

Most dicotyledons are trihistogenic, having an ectohistogen which gives rise to the epidermis of stems and leaves, a mesohistogen giving the mesophyll of leaves and the outer cortex of stems and the endohistogen producing the innermost tissues; the ectohistogen may also take part in the development of leaves as in the rays of the corolla of *Pharbitis*. Bud mutation occurring in one of the histogens can thus produce three types of monoheterogeneous periclinal chimaeras, occurring in two of the histogens it may produce three types of di-heterogeneous periclinal chimaeras and occurring in all three a homogeneous type is produced.

So-called secondary sports can be produced by periclinal chimaeras by rearrangement of the somatic tissues owing to irregularities in ontogeny.

The number of possible types is reduced in some dicotyledons and in all monocotyledons, which have only two histogenic layers; bud variation can then only be monoheterogeneous, or homogeneous as a result of embryonic mutation. In cultivated trees and shrubs it is thus usually monoheterogeneous.

In the gymnosperms, which are believed to have a single histogen, periclinal chimaeras are unknown, though the occurrence of sectorial chimaeras shews that the primary meristem is not a single cell.

In lower groups, having a single apical cell, neither periclinal nor sectorial chimaeras can occur by bud mutation.

781. GAUSE, G. F. and WITT, A. A. 575.41:581.5:519.2
Behavior of mixed populations and the problem of natural selection.
 Amer. Nat. 1935 : 69 : 596-609.

Mathematical expressions are derived for behaviour of a mixture of two different species under different types of conditions and their application to problems of natural selection is illustrated by an example.

ORIGIN OF SPECIES, ETC. 576.1

782. STUBBE, H. 576.1:581
 Rassenentstehung im Pflanzenreich. (**The origin of new races in the plant kingdom**).
 Naturforscher 1935 : 12 : 3-8.

The possible origin of new races as a result of gene mutations or the increase or decrease in chromosome number is briefly discussed. The production of such mutations or chromosome changes by artificial means (X-rays, radium, ultra-violet light, chemicals, sudden changes in temperature, etc.) has shewn that new forms may be produced at will but it is not yet possible to determine which form shall be produced.

It is chiefly the small, scarcely observable differences, which are probably physiological, that are of the greatest importance for breeding. The question of the physico-chemical nature of the genes and the intra-molecular changes which may be brought about offers also a wide field for research.

783. MCNAIR, J. B. 576.16:581.192:581.9
Angiosperm phylogeny on a chemical basis.
 Bull. Torrey Bot. Cl. 1935 : 62 : 515-32.

Some theories on the phylogeny of angiosperms are considered in the light of their chemical constitution. In general it is suggested that more complex chemical products are formed in the temperate regions than in the tropics. (Cf. "Plant Breeding Abstracts," Vol. V, Abst. 930).

CYTOLOGY 576.3

784. KRIVENKO, A. A. 576.312:578.6:575:633
(The aceto-carmin method in cytological investigations).
 Bull. Appl. Bot. Leningrad 1935 : Ser. A (14) : 69-79.

It is no longer sufficient to subject the products of a cross to visual examination alone : both the segregates and the parental forms must in modern breeding be studied cytologically and in order that this should be possible in a large breeding programme it is essential to have more simplified and rapid methods of cytological investigation. One of the most valuable advances in this direction is the aceto-carmin method, which is here described for the benefit of Russian readers. Various successful instances of its application are also described.

785. GOODSPEED, T. H. and UBER, F. M. 576.312:578.6
Application of the Altmann freezing-drying technique to plant cytology. II. Character of the fixation.
 Univ. Calif. Publ. Bot. 1935 : 18 : 23-32.

The method consists essentially of rapid killing of tissue by freezing in liquid air, dehydration by exhaustion at a pressure of about 1 micron of mercury and infiltration with paraffin.

Judged by the coarseness of the reticulation produced in the protoplasm the results were not uniformly good. The resting nuclei of late archesporial tissue and root tip meristems were rather well fixed, in contrast to poor fixation of early and mid-mitotic and meiotic prophase. In meiosis fixation progressively improves as first metaphase approaches and remains good until the end of the second division.

786. HEITZ, E. 576.312.34
Chromosomenstruktur und Gene. (**Chromosome structure and genes**).
Z. indukt. Abstamm. -u. VererbLehre 1935 : 70 : 402-47.

The finer structure of the chromosomes, (chromonema, chromomeres), is discussed particularly in relation to the exact localization of the gene.

The function of the nucleolus and its connexion with the secondary constriction is considered. The distribution of the heterochromatin and euchromatin would appear to have a definite relation with the genetically active and inert regions of the chromosomes and the results of other workers on the localization of the gene are discussed.

787. GEITLER, L. 576.312.34
Morphologie und Entwicklungsgeschichte der Zelle. (Morphology and
process of development of the cell.)
Fortschr. Bot., Berl. 1935 : 4 : 1-10.

A condensed survey of recent findings and theories on nuclear and chromosome structure and the relations between nucleus and plasma.

788. GEITLER, L. 576.312.34
Neueste Forschungen über den Chromosomenbau. (Sammelreferat). [**The latest investigations on chromosome structure. (Review of literature)**].
Züchter 1935 : 7 : 294-304.

A comprehensive survey of recent work on the anatomical and cytological structure of the chromosome, with a bibliography of all the important contributions on the subject during recent years.

789. ELLENHORN, Ja. 576.312.34:575.17:633.16
(**The cytological examination of genetically important structures**).
Bull. Appl. Bot. Leningrad 1935 : Ser. 2 (8) : 3-14.

Examinations were made on the nuclei of *Hordeum vulgare* after previous exposure to low temperature in an ice chest, which treatment brings about a marked shortening of the chromosomes. In resting nuclei the chromatin, when it is present, becomes concentrated at one side of the nucleus, and in the remainder of the nucleus colourless threads can be seen, quite free from chromatin granules.

At prophase the chromatin appears drawn off the thread in the direction of the attachment constriction, and the ends of the threads themselves are clearly seen coiling round each other ; they give no staining with iron haematoxylin but give a strong protein stain. Each chromosome consists of two such threads so that there are 28 of them in *H. sativum*. These threads are thought to be the " skeleton " of the chromosome upon which the chromatin is deposited in early prophase. They rather than the chromonema represent the material which is continuous from mitosis to mitosis, persisting at the dissolution of the chromatin at telophase on the return to the resting nucleus. The division of these threads, to produce four chromatids, occurs only in late prophase and the possibility of their cleavage at telophase is entirely excluded. The observed behaviour of the threads thus corresponds to the scheme of mitosis of Hauptmann, Sharp and Telezyński.

The nature of the skeleton threads was observed in more detail in *Stenobothrus*. They are at first entirely free from chromatin granules. At prophase granules, or chromomeres, begin to appear and increase progressively with the laying down of chromatin. The degree of chromatin condensation varies on different chromomeres so that they ultimately become differentiated according to their size and form.

The skeleton threads are considered to be the gene-bearing material ; this is supported by their behaviour in mitosis and meiosis, their permanency, and the indication of McClintock that a genetical deficiency was associated with the loss of a section of the chromonema. Though neither the chromomeres nor their centres (Belling's " black dots "), can be regarded as the genes because of their impermanency, it is possible that the " individualized " sections of the skeleton thread upon which the chromomeres deposit may correspond to the genes. All the chromosomes, even the sex chromosome in *Stenobothrus*, stain identically with Feulgen's reagent, and the chromatin is considered to have no definite structure and to be genetically " void."

790.

KOSTOFF, D.,

DOGADKINA, N. and TICHONOV, A.

576.312.35:633.71

576.312.35:633.14

576.312.35:634.64

Chromosome number of certain Angiosperm plants (*Nicotiana*, *Petunia*, *Oxalis*, *Secale* and *Punica*).

C.R. (Doklady) Acad. Sci. U.S.S.R. 1935 : 3 : 401-04.

The somatic chromosome numbers of certain plants examined with the object of making interspecific crosses are reported : *Nicotiana Miersii* had 24 ; *N. Cavanillesii* Dun. (*N. noctiflora*), a highly self-sterile species, 24 ; a strain received from the Australian Institute of Plant Industry under the name *N. suaveolens parviflora* and strongly resembling *N. nudicaulis*, in consequence of which it was named *N. suaveolens nudicauleformis*, 48 like *N. nudicaulis*, of which it would therefore seem to be a variety ; another strain isolated from the same Australian sample and named *N. parviflora*, has 32 like *N. suaveolens*, with which it has nothing else in common ; a strain named *N. megalociphon* isolated from *N. suaveolens longiflora* also obtained from Australia, has 39-40 ; and a further strain from the latter Australian sample, and named *N. suaveolens*, 32. *Petunia violacea* has 14, *P. axillaris* 14, and *P. parviflora* 18, this being the first case of a species of *Petunia* with a basic number 9. *Oxalis tuberosus* shewed 63-64 in some forms and 68-70 in others. *Secale Vavilovi* Gross., *S. fragile*, *S. cereale*, *S. ancestrale* Juk. and *S. montanum*, all had 14 ; segregates from the cross *S. cereale* x *S. montanum* with 15 and up to 23 chromosomes were observed, the extra chromosomes all being of normal length and not fragments. Twenty varieties of *Punica granatum* examined all had 18.

791.

LEVITSKY, G. and SIZOVA, M.

576.312.36:537.531:576.312.34

Further studies on regularities in chromosome transformations in *Crepis capillaris* induced by X-rays.

C.R. (Doklady) Acad. Sci. U.R.S.S. 1935 : 4 (IX) : 71-75.

Somatic plates of X-ray progeny were examined and the study clearly shewed that breakages tend to occur more frequently at certain particular points on each chromosome and that all observed translocations are reciprocal. The localization of breakage is ascribed to peculiarities of the internal structure of the chromosomes, possibly degree of stretching. The results lead the authors to conclude that translocations result from two separate breakages followed by reunion.

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792.

PROKOPENKO, N. E.

581.142.03

(Artificially raising the germinating capacity in unripe seeds).

Semenovodstvo (Seed Growing) 1935 : No. 8 : 29-31.

Seeds of wheat, oats, barley and peas were gathered at the wax-ripe stage and subjected to various treatments to increase the germination. Drying at 40°C. for varying periods up to ten days increased the germinating capacity in most of the varieties of the three cereals tested, and particularly in those giving the poorest germination without such treatment, but had no effect in peas. The best conditions and length of treatment were different for each variety. The reaction was especially marked in barley, where a quite high germination was induced even in grain gathered at the milk-ripe stage.

Germination was increased in wheat and oats, and also in peas, by pricking the wax-ripe seeds with needles.

793.

JONES, D. F.

581.143.32:576.356.2

Atypical growth.

Amer. Nat. 1936 : 70 : 86-92.

After reviewing the genetic evidence from plants and animals, the author suggests that deletion or inactivation of genes may play an important part in the production of teratological growths such as galls, tumours, etc.

794. VASIL'EV, Ju. P. 581.162.5:634
(Difficulties in the choice of pollinators).

Naučnoe Plodovodstvo (Scientific Fruit Growing. Bull. Lenin Acad. Agric. Sci., Res. Inst. Fruit Grow. I. V. Michurin) 1935 : No. 4 : 66-68.

Refers to work of Einset (Cf. "Plant Breeding Abstracts," Vol. VI, Abst. 242) and Branscheidt (Cf. "Plant Breeding Abstracts," Vol. IV, Abst. 225).

795. ALEKSANDROV, V. G. and ALEKSANDROVA, O. G. 581.175.11:575:633
(The anatomical analysis of the pigment in the petals of leguminous plants and its application in breeding and genetics).

Bull. Appl. Bot. Leningrad 1935 : Ser. A (14) : 217-32.

To replace the arbitrary nomenclature used for colour shades the authors propose a more precise method of defining the colour of a given plant organ, the method of "chromatic titration." For anthocyanin pigments a mixture of ultramarine and carmine water colours is made up in such proportions as to match the colour in the petal. If yellow pigments are also present a certain amount of cinnabar is also added ; very minute quantities not obvious to the naked eye can be detected in this way, so giving a great deal of information as to the composition of a plant and so a guide as to its genetic constitution in inheritance studies. The petal is mounted in rain water and examined through the microscope and the colour is matched by painting on paper at the side.

Examinations were made of a number of different leguminous species and the types of pigmentation found in these are described. *Lathyrus cicera* was found to be less abundantly pigmented than the wild species *L. Gorgoni*, and to be entirely lacking in a yellow pigment contained in the latter. Again, the Abyssinian forms of *L. sativus* were less intensely pigmented than the Georgian forms, and contained no chlorophyll in the petals. The latter character has proved to be a sign of dominance and the Transcaucasian form is therefore more dominant than the Abyssinian. This is exemplified also by the possession of blue anthocyanin in contrast to pink in the Abyssinian form ; and although because of its irregular distribution the pigment appears to the naked eye paler in the Transcaucasian form this is seen on microscopical examination also to contain a greater quantity of anthocyanin. A form from Afghanistan shewed similar differences from the Abyssinian form and in addition to this the presence of yellow pigment too : this latter was present only in the red and not in the blue Afghan forms. This, together with the more frequent presence of chlorophyll in the red than the blue forms suggests that the red are more primitive. The Indian forms proved on microscopical examination to contain a mixture of both red and blue though this was not apparent by mere visual examination ; neither yellow pigment nor chlorophyll were present in the Indian forms.

Similar examinations were made on *Cicer arietinum* ; the grams from India contain chlorophyll in the petals, which is absent in the ones from Palestine and again the Indian forms are more reddish and the Palestine forms more bluish in shade of the anthocyanin.

The position in peas, *Pisum*, was more or less the same as that described for *Lathyrus*. The peas from Afghanistan, the centre of diversity, are the most dominant, containing chlorophyll in the petals and also yellow pigment in the wing petals, a character mainly associated only with the wild forms. The variety *purpuratum* is peculiar in the possession of identical coloration in the standard and wing petals ; it has a larger amount of chlorophyll than the variety *anthocyanatum*, which contained more of the blue pigment.

Similar observations were made on two species of *Medicago* and their hybrid, which was found to contain the anthocyanin of the one parent together with the yellow pigment characteristic of the other parent.

796. STUBBE, H. 581.48:581.01:575:242

Weitere Untersuchungen über Samenalter und Genmutabilität bei *Antirrhinum majus*. **(Further investigations on aging seeds and gene mutability in *A. majus*).**

Z. indukt. Abstamm. -u. VererbLehre 1935 : 70 : 533-37.

The seeds of a strain of *Antirrhinum* shewed a normal percentage of germination (80 per cent) till in the tenth year there was a sudden decrease to 26.77 per cent. The mutation rate of seeds of the same strain did not shew a simple linear relation with the age of the seed and the possible causes for this are discussed.

FIELD TESTS 631.421

797. TELEGDY KOVÁTS, L. 631.421
A szabadföldi kísérletezés modern módszerei Angliában. (**The modern methods of field experiment in Great Britain**).
Mezőgazdas. Kutatás. 1935 : 8 : 361-74.

In continuation of a report on Rothamsted Experiment Station a short survey is given of present day problems in field experimentation and a discussion of Fisher's contribution to the theory underlying the technique of such investigations.

798. IMMER, F. R. 631.421:519.24
A study of the association between mean yields and standard deviations of varieties tested in replicated yield trials.
J. Amer. Soc. Agron. 1936 : 28 : 24-27.

Correlation studies on the results of variety trials with maize, barley, oats, flax and spring wheat at the Minnesota Agricultural Experiment Station shewed that within the range of yields obtained the standard deviations of the separate varieties tended to be independent of the mean yields of the varieties.

It is concluded therefore that the assumption made in estimating the error variance in Fisher's analysis of variance is a valid one.

INTRODUCTION OF NEW SPECIES 631.524

799. VIKTOROVSKII, G. P. 631.524:578.08:634
(The technique of expeditions to collect wild and local varieties of fruit trees).
Bull. Appl. Bot. Leningrad 1935 : Ser. A (14) : 151-56.

Full instructions are given for the equipment of an expedition for the collection of fruit tree specimens and for the methods of collecting the material, keeping records, etc., etc.

PLANT DISEASES 632

800. 632.3:575.42:633.15
633.15-2.3-1.521.6:575.113.4
WELLHAUSEN, E. J. 635.67-2.3-1.521.6:575.113.4
Selection for virulence in *Bacterium stewartii* (Smith) Migula by repeated passage through resistant and susceptible inbred lines of maize.
Amer. Nat. 1936 : 70 : 71-72. (Abst.)

By passing two strains of *B. stewartii*, one virulent and the other comparatively non-virulent, through a resistant inbred line of dent maize nine times, their virulence was sharply increased, while a marked decrease in virulence occurred after nine passages through a susceptible inbred line of Golden Bantam sweet corn, the greatest change occurring during the first six passages in each case. A positive correlation between virulence and vigour of growth on agar medium was evident.

Two major dominant complementary genes appeared to be involved in the determination of resistance of the host lines.

801. LINDEGREN, C. C. 632.3:576.312:575.17
Genetical studies of bacteria. I. The problem of the bacterial nucleus.
Zbl. Bakt. 1935 : 92 : 40-47.

The author demonstrates that the occurrence of transverse fission does not preclude the possibility of the longitudinal division of a gene string and further shews that there is room in the average bacterial cell for a coiled string containing a number of genes to divide in this way. The presence of genes is evident, that they exist in a diffuse state is unthinkable ; the author tends towards the assumption that they are present in the form of a gene string and in connexion with the failure to demonstrate this in the form of a chromosome it is pointed out that chromatin is not an essential constituent of the gene-bearing matter, even in higher plants.

802. FELLOWS, H. 632.4:633.11(73)
The wheat foot-rots.
 Rep. 3rd Hard Red Winter Wheat Impr. Conf. Nebraska 1935 : 37-38.
 (Mimeographed).

The organisms causing the different kinds of foot rot are briefly mentioned and the localities of the United States of America in which certain of them are common are given.

In connexion with take-all (*Ophiobolus graminis*) it is mentioned that no variety of wheat or any near relative of wheat has been found with resistance to the disease.

803. MEHRLICH, F. P. 632.411.4:576.16:634.774
Pathogenicity and variation in *Phytophthora* species causing heart rot of pineapple plants.
 Phytopathology 1936 : 26 : 23-43.

Variations were found between cultures within the species *P. cinnamoni*, *P. palmivora* and *P. parasitica* of the type recognized in the rust fungi as physiological strains, suggesting the doubtful validity of separating species of *Phytophthora* on the basis of the differential susceptibility of a single host.

Evidence is presented that *Pseudopythium phytophthoron* Sideris is a strain of *Phytophthora cinnamoni* Rands. It is suggested moreover that the latter species might be combined with *P. cambivora* (Petri) Buis. to form the single species *P. cambivora*.

804. HOLTON, C. S. 632.451:576.16:633.11
Studies on seven differentiating characteristics of two physiologic forms of *Tilletia tritici*.
 Phytopathology 1935 : 25 : 1091-98.

Morphological differences between two physiological forms of *T. tritici* are described. Since the pathogenic properties, though most important from the economic point of view, have been found to vary with the environmental conditions (Cf. "Plant Breeding Abstracts," Vol. IV, Abst. 394) it is suggested that differences of the type described might advantageously be considered in establishing a uniform system of identifying and numbering physiological forms of *T. tritici* and *T. levis*.

805. FLOR, H. H. 632.452:576.16:633.854.54-1.521.6
 632.452:576.16:633.52-1.521.6
Physiologic specialization of *Melampsora lini* on *Linum usitatissimum*.
 J. Agric. Res. 1935 : 51 : 819-37.

Using seven differential varieties of *L. usitatissimum* L. 14 distinct physiological forms of *M. lini* (Pers.) Lév. were distinguished in material from 99 collections made in the U.S.A. and in Canada. The distribution of the different forms is given.

The reactions of 165 varieties and strains of dehiscent flax (*L. usitatissimum* var. *crepitans*), linseed, and fibre flax to forms 1 to 5 were tested. A striking feature of the results was the heterogeneity of many of the varieties in respect of rust reaction. It was noted also that very few of the varieties shewed a different reaction to different physiological forms, suggesting that the breeding of rust-resistant varieties should not be too difficult a task.

806. BROWN, A. M. 632.452:577.8:633.854.78
A study of coalescing haploid pustules in *Puccinia helianthi*.
 Phytopathology 1935 : 25 : 1085-90.

Of 288 carefully selected pairs of monosporidial haploid pustules of *P. helianthi* on seedlings of *Helianthus annuus* L., 110 producedaecidia when they coalesced. Since the transfer of pycnidial nectar from one member of the pairs to the other was prevented by means of a barrier placed between them on the upper surface of the leaf, it follows that the diploidization which must have occurred to bring about the production ofaecidia was the result of hyphal fusion. This conclusion was supported by the actual finding of hyphal fusions in the coalesced pustules. Aecidium formation invariably began first in one of the paired pustules and was complete or almost complete in that member of the pair before it began in the other.

807. JOHNSON, E. M. and VALLEAU, W. D. 632:484:575.247:633.71
Cultural variations of *Thielaviopsis basicola*.
 Phytopathology 1935 : 25 : 1011-18.

Cultures of *Thielaviopsis basicola* (Berk.) Ferraris isolated from infected roots of White Burley tobacco differed from one another when grown on potato-dextrose agar in tubes and when transferred to Petri dishes produced numerous sectors differing in cultural characters. Single-endoconidium cultures were also unstable and behaved in the same way. The different cultures thus produced differed very little in pathogenicity with the exception of an albino strain which seemed slightly more pathogenic than the others.

It appeared that factors for the production of colour or of endoconidia had been lost in certain strains and it is considered that the phenomenon, though the cause is unknown, is genetical in nature.

ECONOMIC PLANTS 633

808. MÜNTZING, A. 633:576.3(48.5)
 Berättelse över verksamheten vid Sveriges Utsädesförenings kromosomavdelning under tiden 1 oktober 1931—30 september 1935. (**Report on the activities of the Swedish Seed Union's cytological department during the period 1st October, 1931—30th September, 1935**).
 Sverig. Utsädesfören. Tidskr. 1933 : 45 : 305-20.

The results, including those from certain herbage crops, of the four year's work are divided according to crops giving the aims from the investigations, their results and future problems.

Potatoes.

Crosses have been made between South American varieties with 36 chromosomes and the usual cultivated tetraploid varieties. Among the progeny a promising new series was obtained in which the chromosome numbers varied from 43-48.

Further crosses on a larger scale should produce plants with 60 chromosomes. Also crosses with the 60-chromosome South American sorts are to be made and should give series with new chromosome numbers.

Investigations on the chromosome number of the South American varieties are being continued.

Root crops.

The preliminary stages for the production of a new, constant and fertile form by crosses between turnip and swede have been begun. Their practical value still has to be proved.

Wheat and rye.

Studies are being made on constant wheat-rye hybrids and also on the possibility of producing hybrids between emmer wheats and rye, between *monococcum* and emmer wheats and between wheat and *Agropyrum*.

Future work includes the improvement of the constant wheat-rye hybrids with 56 chromosomes.

Oats.

Work on oats was only begun this year. Crosses have been made between *A. sativa* and *A. strigosa* to produce a 56 chromosome type analogous to the wheat-rye hybrids.

Barley.

Higher chromosome types of barley are to be induced by heat treatment. A plant with tetraploid roots has resulted and it is hoped that the whole plant may prove to be tetraploid.

Among the special methods that are being investigated is the separation of pollen grains with increased chromosome numbers and the fact that in wheat it has been found that when twin embryos occur one is likely to have a higher chromosome number than the normal.

809. KOTOV, M. I. 633:581.6(47.7)
(Wild economic plants of the southern Ukraine.)
 Priroda (Nature) 1935 : No. 7 : 55-56.

The locations of a number of wild forms of potential economic value are recorded from the data collected by an expedition to the southern Ukraine.

The more important plants mentioned include : the wild almond ; *Crambe maritima*, which is being cultivated, and *C. tataria* ; *Cakile maritima*, a potential source of oil ; *Daucus bessarabicus* ; *Cynanchum acutum*, *C. Vincetoxicum*, and *Senecio macrophyllus*, all three rubber bearing plants ; and *Glycyrrhiza glabra* which yields liquorice but little inferior to the Asiatic product.

810.

633.1:575(47)

635.656:575(47)

(Regionalization of varieties of cereals).

Lenin Acad. Agric. Sci., Inst. Pl. Ind., Var. Testing Service 1935 : Pp. 408.

It is planned that in the second Five Year Plan 75 per cent of the total area under cultivation will be brought under pure-bred varieties produced by the breeding stations. To achieve this a well organized system of seed control is necessary, combined with a thorough knowledge of the properties of the respective varieties, the regions and precise requirements for which each is suited, etc. All possible types of growth conditions are to be found in the Soviet Union and varieties are required which are adapted to all these different conditions. The present monograph embodies the results of extensive tests of the new varieties of all the main cereals, including maize, and of peas. The varieties are described and illustrated, with indications of the regions, growth conditions and purposes for which each is most suited. The origins of the varieties are also given and for each crop in turn recommendations are made as to the most suitable varieties for cultivation in each individual region of the U.S.S.R. and tables of data give the present area under the different varieties and that planned for 1937.

811. DUCELLIER, L.

633.1:575(65)

Improvement of cereals in Algeria.

Int. Rev. Agric. Rome 1935 : 26 : T 529-37.

Observations on the history of the development of wheat culture and improvement in Algeria. A number of the earlier and more recent products of selection and breeding operations are enumerated, with special mention of certain improved and highly productive lines of the Sahara wheats which are remarkable for their resistance to heat and high yield in suitable environment.

The barley grown in Algeria comprises several species and varieties and a very heterogeneous collection of types. Improvement work is in progress and over 100 lines from hybrids from an Algerian 2-rowed x 4-rowed cross are being tested.

The oats cultivated in Algeria also show a considerable range of varieties and types.

Avena algeriensis L. (Grabut), mainly the red oats Nos. 31 and 61, are the only kinds grown in Algeria and selected types of these have proved better than any others.

The rye of North Africa is very heterogeneous. It is not, however, cultivated to any great extent. Cereal improvement in Algeria is carried out by the Agricultural Institute in collaboration with the technological laboratories, experiment stations and farms and the agricultural services for seed testing and for the multiplication of varieties and breeding of superior types. Conditions of cultivation and labour, however, make it difficult to preserve the purity of varieties in general cultivation and an appeal is made to agricultural associations to aid in the production of pure seed and in encouraging the use of varieties of recognized value. The extra cost of producing improved cereals could be met by adopting a system of premiums as has been done in other countries.

812. ISAEV, S. I. and TIMOKHINA, P. I.

633.1:575.127:63.00.14

(Michurin's varieties in the Ivanov Region.)

Naučnoe Plodovodstvo (Scientific Fruit Growing. Bull. Lenin Acad. Agric. Sci., Res. Inst. Fruit Grow. I. V. Michurin) 1935 : No. 2 : 7-18.

A report is given of the success of a number of Michurin's new varieties of apple and pear tested in a large number of different estates in different parts of the region in question, terminating with a table indicating those varieties that are recommended for cultivation and for trial.

813. AASE, H. C.

633.1:576.312

Cytology of cereals.

Bot. Rev. 1935 : 1 : 467-96.

The literature, including work published in 1935, on the cytology of the "small grains," wheat, rye, oats, barley and *Agropyrum*, is briefly reviewed. The bibliography comprises 125 titles.

WHEAT 633.11

814.

RODENHISER, H. A.

Results from uniform bunt nurseries.

Rep. 3rd Hard Red Winter Wheat Impr. Conf. Nebraska 1935 : 35-37.

(Mimeographed).

633.11 Yogo

633.11-2.451.3-1.521.6(73)

To determine the varietal resistance of wheats to bunt, uniform nurseries are maintained in each of the general wheat regions of the United States of America, where are tested the wheats grown in the uniform plot tests or uniform yield tests (see Abst. 864) as well as new strains which have shewn indications of bunt resistance.

Several lines have shewn less than 1 per cent infection as compared with 45.2 per cent on the susceptible control, and the new variety Yogo has had an average of 1.3 per cent of smut in the last three years.

It has been found, however, that only two of the ten known physiological forms of *Tilletia levis* are present in the trials and co-operative tests are being started in the autumn of 1935 with the object of testing resistance to all the known strains of *T. levis* and *T. tritici*.

In the discussion it is stated that the majority of spring wheat smut collections have proved to be among the least virulent strains on winter wheat.

815.

DUCOMET, V.

Les blés de la région de l'olivier, (Bassin Méditerranéen). [**The wheats of the olive growing region (the Mediterranean Basin).**]

Sélectionneur 1935 : 4 (2) : 12-48.

633.11(44)

633.11:575(44)

Remarks on the wheats grown in Departments of Corse, Pyrénées-Orientales, Aude, Gard, Hérault, Var, Ardèche, Drôme, Vaucluse, Bouches-du-Rhône, Basses-Alpes and Alpes-Maritimes. The creations of Vilmorin and Schribaux, the old Touselles forms and many imported Italian and British wheats are mentioned and many synonyms of various wheat names are given. The various crosses that have been made from time to time in the course of improvement work are also cited. Most of the work outlined has already been referred to in "Plant Breeding Abstracts."

816.

MONTEIRO, A. DA CUNHA

Trigos Portugueses. (Estudo da sua distribuição no país). [**Portuguese wheats. (Study of their distribution in the country).**]

Bol. Estac. Agr. Cent. Lisboa 1935 : No. 17 : Ser. A : Pp. 89.

633.11(46.9)

On beginning wheat breeding work in Portugal a collection has been made of all the local varieties, which proved extremely heterogeneous. From these the various types have been isolated and are described and illustrated, the varietal composition of all the different sections of the country being discussed. Tables shewing the main characteristics of a large number of these types are given.

817.

NOVOLOTSKII, A. V.

(New varieties of spring wheat).

Selektsija i Semenovodstvo (Breeding and Seed Growing) 1935 : 2/10 : 49-52.

633.11:551.566.3:575(47)

For growing in the northern zones of the U.S.S.R. the only variety possessed of sufficient earliness and other biological characters is Novinka, but it is deficient in many important agronomic respects. Six new varieties are now under trial as probable substitutes. The first of these, TZA 32, exceeded Novinka in yield by 18 per cent, with a yield of 20 centners per ha. over a nine-year period in the Leningrad region, though it was 2-3 days later in maturity. The second GDS 25, was produced from a cross of Breslau with a Canadian variety of *hostianum* : it belongs to the variety *barbarossa*. The third, GDS 33, a variety of *erythrospermum*, was produced from a cross of Novinka and Grenadier II. The two latter hybrids have both shewn yield excesses of 4 c. per ha., representing 24 per cent, over Novinka in a three years' test. Both are equal to Novinka in earliness, although GDS 33 has a winter wheat for one of its parents. Figures for quality shew that although they are not quite equal to Novinka in this respect the new hybrids

are of high quality and actually exceed Novinka in protein content. GDS 33 is the best of all the hybrids as regards quality.

Three further *erythrospermum* hybrids are referred to, all produced from crosses of the Canadian varieties Prelude, Preston and Marquis with the Siberian wheats *rossicum*. Under field conditions they exceeded Novinka in yield by 3.5 to 5 c. per ha., i.e. 24–27 per cent, GDS 49 and 53 maturing at the same time as Novinka and Garnet and GDS 24 slightly earlier. They excelled Garnet in yield by almost equal amounts. The two former were almost equal to Novinka in quality.

818. 633.11:575(016)
(Bibliography of world literature on the genetics and breeding of wheat).

Bull. Appl. Bot. Leningrad 1935 : Ser. V–A (1) : Pp. 135.

A very complete bibliography on wheat breeding and genetics, articles being classified according to subject and arranged chronologically within the sections. The bibliography has been compiled from the catalogue of the library of the Institute of Plant Industry, Leningrad, and from the main reference journals including Resumptio Genetica, Plant Breeding Abstracts, Zeitschrift für Züchtung and others. Where abstracts appear in any of these journals the reference is appended to the reference to the article concerned, thus very greatly enhancing the value of the compilation for reference purposes.

The following are some of the main headings : world resources of wheat ; origin of wheat, karyosystematics and cytology ; interspecific and intergeneric hybridization, speltoids and chromosome aberrations, breeding for yield, breeding for immunity, works on wheat breeding by countries.

This bibliography is to be the first of a series and we shall look forward to later numbers with interest.

819. 633.11:575(44)
TÉZIER, P.
L'amélioration du blé dans le Sud-Est de la France. (The improvement of wheat in the South East of France.)
Sélectionneur 1935 : 4 (2) : 49–54.

A description of wheat improvement work in south-eastern France since 1918–19, a period when in the south of France plant breeding methods were an innovation. The programme laid down was based on (1) the improvement of local wheats by the selection of the best pure strains ; (2) the study of large collections of the best foreign varieties as a possible source of good breeding material ; (3) the hybridization of the best types in order to obtain new high yielding varieties of good baking quality. Success has attended these methods and already there exist many superior local wheats, as well as Italian and hybrid forms bred in the south of France.

820. 633.11:575(47)
633.11:551.566.3
633.11 Novinka

***PISSAREV, V. E.**

(New promising varieties of wheat bred at Detskoe Selo).

Bull. Appl. Bot. Leningrad 1935 : Ser. A (14) : 167–72.

Descriptions are given of the most promising of the new wheat varieties produced by the Institute of Plant Industry, Leningrad. First comes Novinka, from a cross between Prelude and Preston and distinguished for its yielding capacity and earliness ; in the period 1925–1933 it gave an average yield of 30.23 centners per ha. as against a general average of 15.8 for all varieties, while in quality it is far above all others ; near Leningrad it matures in 95–97 days.

Numbers of crosses have been made between Novinka and later maturing varieties with the object of improving the yield and removing certain defects of Novinka such as weakness of straw and a tendency to shedding. Similar crosses have also been made with Prelude, which has proved a very successful parent.

Some thirty of the most promising hybrids are described, with indications of their origin.

* An abridged translation of this paper is on file at the Bureau.

821. MELAS, T. V. 633.11:575(49.5)
 La station de recherches pour l'amélioration des plantes de la grande culture.
 Salonique.—Grèce. (**The research station for the improvement of crop
 plants. Salonika—Greece**).
 Ann. Gembl. 1935 : 41 : 293-98.

The work of the station which has been engaged in testing foreign varieties of wheat for earliness, resistance to rust and drought, etc. has already been reviewed (Cf. "Plant Breeding Abstracts," Vol. VI, Abst. 130).

Hybridization is also being carried out to obtain new varieties, some with the ecological adaptation of Mentana but resistant to heat injury and others ecologically suited to red clay soils but also resistant to drought.

Finally the identification and description of the indigenous wheats from observations on pure lines has been undertaken and methods of determining their resistance to drought and their reactions to acid soils have been evolved. The reactions of wheats from different countries to low temperatures and of Greek varieties from the point of view of baking value have also been studied.

822. CLARK, J. A. 633.11:575(73)
Registration of standard wheat varieties, II.
 J. Amer. Soc. Agron. 1936 : 28 : 64-65.

A list of 35 varieties registered as standard, but not as improved, varieties is given.

823. 633.11:575(73)
 633.11 Hymar
 633.11 Comet
 633.11 Clarkan

CLARK, J. A.
Registration of improved wheat varieties, IX.
 J. Amer. Soc. Agron. 1936 : 28 : 66-68.

The character, performance and origin of three new varieties are briefly described, the varieties being Hymar, a soft white winter club wheat, Comet, a hard red spring variety and Clarkan, a soft red winter wheat.

824. QUISENBERRY, K. S. 633.11:575(73)
Genetic studies of winter wheat.
 Rep. 3rd Hard Red Winter Wheat Impr. Conf. Nebraska 1935 : 27-28.
 (Mimeographed).

The different studies in progress in the United States of America are briefly indicated. In the discussion the work in Minnesota, South Dakota and Montana is briefly described.

825. PARKER, J. H. 633.11:575"793"(78.1)
Breeding early winter wheats.
 Rep. 3rd Hard Winter Wheat Impr. Conf. Nebraska 1935 : 18-20.
 (Mimeographed).

Early varieties of hard red winter wheats are needed by Kansas farmers to grow with standard varieties. The variety Quivira has been bred from the cross Kanred x Prelude and yields well when it is not injured by winter-killing, to which early varieties seem particularly prone, apparently owing to a physiological correlation. The milling and baking qualities of Quivira are not entirely satisfactory, however, and two selections from Kanred x Hard Federation, Kansas Nos. 2672 and 2673 are more satisfactory in this respect.

Quivira and Kansas No. 2673 ripen about a week earlier than Turkey and are probably more winter-hardy than any strain of hard red winter wheat of equal earliness in the United States of America.

Other crosses in which these strains or other early forms like Early Blackhull have been used to introduce earliness are also being tested. The use of early, high quality varieties of hard red spring wheat such as Reward as a source of earliness is also recommended.

826.

WORZELLA, W. W. and CUTLER, G. H.

Carotenoid pigments in wheat with special reference to varieties and strains.

Cereal Chem. 1935 : 12 : 708-13.

Since the amount of carotinoid pigments present in wheat are closely related to the colour of the flour the possibility of breeding new wheat varieties of suitable carotinoid content arises. Using finely ground whole meal from 29 varieties and 72 hybrid strains of wheat the carotinoid pigments present in the different forms was quantitatively determined.

The results indicate that carotinoid pigment is an inherited varietal characteristic.

A number of hybrid families were apparently homozygous and others heterozygous for the carotinoid pigment content which was also observed to be consistently high or low in certain families. (Cf. "Plant Breeding Abstracts" Vol. V, Abst. 307.)

827.

SMITH, L.

Cytogenetic studies of *Triticum monococcum* and *T. aegilopoides*.

Amer. Nat. 1936 : 70 : 66-67. (Abst.)

633.11:575.127.2:576.356

633.11:575.243"793":537.531

The F_1 hybrids of crosses of four varieties of *T. monococcum* ($n = 7$) with *T. aegilopoides* var. *baidaricum* ($n = 7$) have a ring of 4 chromosomes and 5 closed bivalents at metaphase I of meiosis. In the F_2 192 normal, 192 ring and 16 asynaptic plants were obtained. Although the chromosomes in the ring open out alternately in only about one half of the pollen mother cells, many ring plants produce normal pollen and over 50 per cent fertile ovules, suggesting directed segregation.

The asynaptic plants are vegetatively vigorous but produce no good pollen and only an occasional functional ovule. The character appears to be governed by two unlinked factors independent of the ring-forming chromosomes.

T. monococcum x *T. aegilopoides* var. *stramineonigrum*, like intraspecific hybrids of *T. monococcum*, gives 7₁₁ at meiosis in the F_1 , while *T. aegilopoides* var. *baidaricum* x *T. aegilopoides* var. *stramineonigrum* gives a ring in F_1 but no asynaptic plants in F_2 .

Numerous mutants have been induced by X-ray treatment of *T. monococcum* including two mutant recessives for early maturity making it possible to grow three to four generations per year. Linkage determinations are in progress for 12 selected mutants.

828.

MIÈGE E.

633.11:575.127.2:581.481

Constitution et descendance des lignées polycarpiques de *Triticum vulgare* H.**(Constitution and progeny of polycarpic lines of *T. vulgare* H.)**

C.R. Acad. Sci. Paris 1935 : 201 : 409-10.

A further note on the occurrence in several lines derived from an interspecific hybrid of *T. vulgare* (*T. vulgare* var. *alborubrum* x *T. vulgare* var. *oasicolum*) of flowers producing each two or three fertile seeds. In the early generations (1928-31) the number of flowers with multiple grains increased gradually up to an average of 70.5 per cent for one line, then became irregular, varying from 0-100 per cent according to the individual and for the last yield recorded 21 per cent.

Examination of some hundreds of flowers has invariably shewn the double or triple carpels to be normal and independent. The multiple grains are slightly deformed by pressure, their dimensions and weight are below normal and the coleoptiles produced are also slightly under-developed. From a cytological examination of the anthers of polycarpic forms, the multiple grains are regarded as being normal in chromosome number and behaviour. (Cf. "Plant Breeding Abstracts" Vol. 2, Abst. 51).

829.

KATTERMANN, G.

633.11:575.127.5:633.14:576.354.4

Die Chromosomenverhältnisse bei Weizen-Roggenbastarden der zweiten Generation mit besonderer Berücksichtigung der Homologiebeziehungen. (The chromosome behaviour in wheat-rye hybrids of the second generation with special regard to the homology relations).

Z. indukt. Abstamm. -u. VererbLehre 1935 : 70 : 265-308.

The number of chromosomes and the course of the reduction division in wheat-rye hybrids

back-crossed to wheat has already been described by the author (cf. "Plant Breeding Abstracts," Vol. V, Abst. 77). The present study is a detailed account of the various configurations found in similar hybrids, of the probable homology relations and the identification of the rye chromosomes. The number of univalents in the 47 plants investigated with 38-52 2n chromosomes ranged from 4-21 with a general tendency for an increase in the number of univalents as the number of the somatic chromosomes decreased. The number of bivalents varied from 7-22 and there is an unmistakable increase in number of bivalents as the chromosome complement increases. The occurrence of multivalents (3-6) was very variable.

There was a series of variations, often very asymmetrical, in the formation of uni-, bi- and multivalents which was characteristic for each plant and the various causes for this variability are discussed. The formation of multivalents depends most probably on the polyploid nature of the wheat and rye chromosome complements.

The homology relationships are discussed with the help of a series of structural models and were found to provide further support for the genom analysis of Kihara and Nishiyama.

A table shows the distribution of the various forms of multivalents in the plants studied.

The plants with 48-50 chromosomes shewed, as a rule, a preponderance of quadrivalents. Those with under 48 or above 50 had a greater number of trivalents which must probably represent quadrivalents lacking the fourth partner.

A consideration of the cytological results suggested that 2-7 rye chromosomes were present in the " F_2 " plants but further investigations are needed to confirm these findings.

830.

633.11:575.127.5:633.14:581.44

633.11:575.127.5:633.14-1.557

KATTERMAN, G.

Genetische Ergebnisse bei Weizenroggenbastarden bis F_4 . Mitteilung I: Die Behaarung des Halmes und Beziehungen dieses Merkmals zu Strohlänge und Bekörnung. (**Genetic results with wheat-rye hybrids up to F_4 . I. Pubescence of the stems and the relationship of this character to length of straw and set of grain**).

Pflanzenbau 1935 : 12 : 131-49.

From a cross between the *albidum* variety of *vulgare* wheat series and an inbred form O_1 of *S. cereale* var. *vulgare* 12 plants were obtained from 90 flowers pollinated.

In F_1 rye was dominant only in one easily discernible character, pubescence of the stem under the ear; but even in the F_1 the degree of expression of this characteristic was not uniform.

Most of the other characters such as form, colour and size of the empty glumes, density and length of ear, number of spikelets, anther size, length of straw, etc. exhibited either intermediate conditions or else the wheat parent was clearly dominant.

The F_1 plants were completely pollen sterile and artificial back-crossing or natural pollination with wheat pollen in the vicinity had to be used; the latter method gave a comparatively high set of seed.

In attempting to determine whether rye characters can be fixed in combination with those of wheat the feature chosen for study was the easily identifiable pubescence below the ear. It exhibited very great variation and even differed in degree on the tillers of the same plant—a phenomenon which may be due to somatic mutation as a result of irregular somatic divisions in the hybrid (Cf. "Plant Breeding Abstracts," Vol. V, Abst. 77).

In the F_2 the proportion of plants with pubescent stems was 75.7 per cent of the total progeny of 66 plants, but in F_2 and F_4 the number of families containing such plants and the number of such plants from segregating families decreased, the wheat characters predominating. Nevertheless a few exceptional constant or nearly constant strains with the pubescent stem of the rye combined with wheat characters were observed. These have not yet been exactly analysed.

From data on families segregating for pubescence it seems likely that the pubescence factor is probably linked with other rye factors which cause a reduction in length of straw and to a slight extent also in the set of grain.

It is provisionally suggested that the pubescence factor in these constant hybrids (which are not to be confused with intermediate constant hybrids) is situated in a pair of homologous chromosomes and not as seems probable in the segregating families, in the univalent chromosomes. Further confirmatory tests and cytological investigations are contemplated.

831.

SANDO, W. J.

Intergeneric hybrids of *Triticum* and *Secale* with *Haynaldia villosa*.

J. Agric. Res. 1935 : 51 : 759-800.

633.11:575.127.5:633.289

633.14:575.127.5:633.289

Crosses were made between *Haynaldia villosa* and *Triticum aegilopoides*, *T. Timopheevi*, *T. dicoccoides*, *T. dicoccum*, *T. durum*, *T. polonicum*, *T. turgidum* and *Secale fragile* and the F_1 plants raised. Unsuccessful attempts were made to cross *H. villosa* with *T. vulgare* varieties, *T. compactum*, *T. Spelta*, *S. cereale* and *S. cereale ancestrale*. *H. villosa* was used as the pollen parent in all crosses.

The F_2 s in general resembled the *Triticum* or *Secale* parent, but a detailed study of 52 characters shewed that in most cases they were intermediate in the hybrids. Some characters, however, shewed more or less complete dominance of one parent.

The F_1 hybrids were all completely self-sterile, with one exception. *T. turgidum* var. Alaska \times *H. villosa* produced an average set of seed of 3.8 per cent while the F_2 and F_3 generations, in which no apparent segregation occurred, gave 29.7 and 58.5 per cent average sets respectively.

832.

VERUSHKINE, S. M.

(On the ways towards perennial wheat).

Socialistic Grain Farming, Saratov 1935 : No. 4 : 77-83.

633.11:575.127.5:633.289

633.11:575"793"

Reference is made to the numerous useful qualities in the three species of *Agropyrum* that cross with wheat (Cf. "Plant Breeding Abstracts," Vol. VI, Absts. 137 and 138) and which it would be desirable to introduce into wheat, for instance resistance to drought, cold, salty soil and various diseases, vigorous growth and lastly the perennial habit. The success of crossing depends very largely on the choice of parental strains, the success in different combinations varying from 7-10 to 90 or more per cent. The fertility of the F_1 hybrids also varies, being highest in some combinations of *Triticum vulgare* \times *A. elongatum*. Thus as many as 3,000 grains were obtained from seven plants of the wheat Sarrova \times *A. elongatum*, whilst from another *T. vulgare* with the same species of *Agropyrum* only 14,000 grains were obtained from 2,000 plants. Even different plants in the same F_1 vary in fertility. Great variations in fertility, as well as in all other characters, occur in the later generations. These, mainly obtained by back-crossing with wheat in the crosses with *A. trichophorum* and *A. intermedium*, contain less and less perennial forms, though the expression of this character varies with growth conditions, being more pronounced in the greenhouse than in the field. The later generations of the cross with *A. elongatum*, being largely obtained by selfing, contain many more perennial forms, sometimes up to 90 per cent, and in other ways more nearly resemble the *Agropyrum* parent. One constant perennial line was isolated from this cross in 1934 and is described and illustrated. It has an ear intermediate in type and small grain of the wheat type. Thus the possibility of obtaining true-breeding perennial lines from the cross has been demonstrated and it only remains now to isolate a form of higher quality.

Many of the annual forms are also of exceptional interest for breeding, being distinguished by productivity, good vitreous grain, and complete resistance to rust and smut and this part of the problem can definitely be said to have been achieved.

The high degree of pairing in the hybrids, where up to 21 bivalents have been observed, indicates the close relationship between the two genera. This supports the hope that the desired combinations will be attained, and suggests that the genus *Agropyrum* may contain the ancestors of the genus *Triticum*, in which case such crosses as these gain enormously in importance.

833.

VAKAR, V. A.

[*Triticum-Agropyrum* hybrids. (A hylogenetical investigation).]

Bull. Appl. Bot. Leningrad 1935 : Ser. 2 (8) : 121-61.

633.11:575.127.5:633.289:576.356

After a review of the literature on the subject the author describes the results of four crosses of different wheat varieties all pollinated with *A. elongatum*. All attempts to cross *A. repens* were

unsuccessful. The hybrids were obtained in 1932 and sown in the spring of 1933 in the open. They all had a protracted period of tillering, shewing the characters mainly of the *Agropyrum* parent, though in the density of the ears and the width of the empty glumes, the influence of the wheat parent was apparent. The hybrids with Hope, *caesium* 0111 and Baart x Hussar formed ears but these proved self-sterile; the hybrid with *Triticum durum* Nosatovski C-174 gave no ears at all. Further crosses were made in 1933 and four grains were obtained from the cross with *T. durum* Mindum and 22 from that with *T. durum* lybicum 1606. They tillered the whole summer of 1934 and only at the beginning of September some of them began to form ears. In habit the hybrids mostly resembled the ones of the previous year, except that some were awned. A success of 47 per cent was obtained in the crosses of 1932 and 54 per cent in 1933.

All the hybrids of the previous year over-wintered successfully, though the most winter-hardy of all the wheat varieties and wheat-rye hybrids were considerably damaged. The hybrid (Baart x Hussar) x *A. elongatum*, which had produced two ears the previous year, in 1934 gave 14 further ears. Ears were formed on the other hybrids too, all of which exhibited remarkable vegetative vigour (heterosis) and on some as many as fifty ears were formed. These were pollinated with fresh pollen of various species of rye and wheat. Observations made up to the present indicate a not very high degree of fertility.

Meiosis was studied in the pollen mother cells of the F_1 hybrids and the results are presented slightly more fully than in the German paper previously reviewed (see "Plant Breeding Abstracts" Vol. VI, Abst. 506).

The cross *T. durum* lybicum 1606 was slightly different in behaviour from the other *durum* hybrids in that the chromosomes frequently almost or entirely failed to divide in the first meiotic division and divided in the second division with the production of dyads with the somatic chromosome number. The pollen was well-formed and had the appearance of fertility, so that great hopes are attached to this hybrid.

A second hybrid of this same combination is highly peculiar in that meiosis instead of taking place in the pollen mother cells occurred later, within the fully formed pollen grains. In some cases only 14 instead of 28 chromosomal units were present, either resulting from the double conjugation of the bivalents into quadrivalents and the univalents into bivalents, or from a double reduction, one in the archesporial cells and the other normally at meiosis, leading to the development of "dyad pollen." The whole process is intensely complicated and no full explanation is yet forthcoming. No tetrad pollen was observed. The dyad pollen matures normally and has every appearance of being fertile, which is another point for which this unusual hybrid is of interest.

The percentage success obtained in the above crosses is considerably greater than the success obtained in crosses of wheat with *Aegilops* or rye. This applies equally to the wheats of the spelt or emmer group. *T. monococcum* crosses with much more difficulty, but the author has made successful crosses of *A. elongatum* with rye and with *Aegilops speltoides*. The high degree of chromosome pairing also indicates a close relationship between *A. elongatum* and the two wheat species used in the present experiments. However, the self-sterility is much higher than in many other crosses, e.g. between wheat species, with a much lower degree of pairing and greater meiotic irregularity. This sterility therefore appears to be of a genetic rather than a cytological nature. Brief reference is made to unpublished data on a self-fertile hybrid of *T. vulgare* x *A. elongatum* in which all three wheat genomes *A*, *B* and *D* conjugate with the corresponding *Agropyrum* genomes whilst the two remaining genomes of the latter, X_1 and X_2 , conjugate autosyndetically, giving 28 bivalents in all, with regular meiosis and the production of fertile pollen. This finally proves that *A. elongatum* contains the three *T. vulgare* genomes plus two further genomes that are closely related one to the other. It is the presence of the *T. vulgare* genomes in *A. elongatum* which causes the F_1 with *T. durum* to be almost identical with the F_1 with *T. vulgare* and lack all typical *durum* characters.

The author concludes that at least this one species, *A. elongatum*, really belongs to the genus *Triticum*. This close relationship, together with the cases of fertile hybrids above referred to, leads to great optimism with regard to the transference of the many valuable *Agropyrum* characters to wheat by hybridization.

834. MIÈGE, E. 633.11:575.22:581.02:575.3
Morphological variations in wheats.
 Int. Rev. Agric. Rome 1935 : 26 : T409-18.

For some twelve years comparative observations have been taken at the Rabat agronomic research station on variation in wheat and at other places in Morocco and also similar observations have been taken on many of the same strains grown under entirely different conditions of soil, climate, etc., at Verrières in France.

It has been found that thickness of straw, ear shape and colour, awns and length of teeth of the glumes are the features which vary most frequently under the influence of the length of the period spent in the changed environment.

Variations in the different localities were more constant and more regular than variations produced by time.

Though such modifications are often profound and biological characters, such as earliness and disease resistance, may be affected, the variations are not hereditary and the plants revert to their original type when returned to the place from which they originally came.

The secondary characters are preserved in a variety regardless of the environment in which it is grown.

According to the variety, the introduction of a pure line into a new surrounding may be followed either by diminution in vigour, height, yield and certain morphological changes until stabilization is reached, or by the opposite phenomena of general improvement and heterosis, persistent or decreasing until a type superior or equal to the original is reached.

835. DUKHOPEL'NIKOVA, E. 633.11:575.22:581.46
(Calculating the variability of varietal characters in winter wheat).
 Semenovodstvo (Seed Growing) 1935 : No. 6 : 23-24.

The length of the tooth of the empty glume proved very variable and not a very reliable index of varietal purity.

836. ISIKAWA, K. 633.11:575.242(52)
(Occurrence of speltoid mutants in some Japanese varieties of wheat I-II).

Agric. and Hort., Japan 1934 : 9 : 1361-71, 1556-71, 2244-47.

In pure strains of Japanese varieties of *Triticum vulgare* speltoid mutants may often occur which segregate into their own type, normals, homozygous speltoids, compactoids and dwarf compactoids, segregation differing according to the variety used.

Mosaics too often occur, e.g. normal + speltoid, speltoid + compactoid, awned + awnless, etc. The mutation percentage lies between 0.08 and 0.3 per cent.

837. VASILIEV, B. and KAMENIK, J. 633.11:575.242:576.312.36
(On the genetics of speltoids.)
 Bull. Inst. Genet. S.S.S.R. 1935 : No. 10 : 7-17.

A further study was made on the progeny of a heterozygous speltoid obtained by Philiptschenko in 1926 in a cross of Marquis by *Triticum compactum*. All the homozygous speltoid and normal segregates have bred true whilst the heterozygous segregates have continued to segregate in the ratio 1 normal : 1.25 heterozygotes : 1 homozygote, all the homozygous speltoids having awns and being later in maturity than the awnless normals. However in 1932 in the progeny of a homozygote there appeared one plant that resembled the normals in all but the possession of awns ; it matured even before the normals. One such plant occurred in a family containing 33 homozygous speltoids, 8 heterozygotes and 6 normals. It contained 42 chromosomes. The normals and homozygotes bred true, the heterozygotes segregated as usual, whilst the new type segregated into *compactum* type, normal (*vulgare*) type, and speltoid type in the ratio 1 : 2 : 1 ; all were however awned. Segregation occurred also in certain other characters.

The second generation from these plants could be divided into five types, *compactum*, lax *compactum*, *vulgare*, dense *Spelta* and *Spelta* ; grouping the first two and last two together a total ratio of 132 compactoid : 212 normal : 58 speltoid was obtained ; all plants were again

awned. Examining the progeny of the three different types it is seen that the normals gave all three types in a ratio of approximately 1 : 2 : 1, the *compactum* gave *compactum* and normal only, and the speltoids normal and speltoids only.

Plants of all the five types had 42 chromosomes. The origin of the new type is attributed to the formation of 21 and 17 chromosome gametes by the original 40 chromosome speltoid, with the formation of a 41 chromosome speltoid, in which the occasional union of two 21 chromosome gametes would give the 42 chromosome new type. The extra chromosome is not the same as the normal chromosome in the original *vulgare* and *compactum* parents and so does not bear the awnless gene; it is also different from the speltoid chromosome, and is responsible for the *compactum* type, so that the new 42 chromosome individual can give the following gametes $19 + Sp + Co$, $19 + 2 Sp$ and $19 + 2 Co$. Different combinations of these gametes give compactoid ($19_{11} + 3 Co + Sp$), *vulgare* ($19_{11} + 2 Co + 2 Sp$) and speltoid ($19_{11} + Co + 3 Sp$), which all being heterozygous segregate into *vulgare* and types similar to themselves. The corresponding homozygous forms have not yet been obtained, possibly owing to insufficient numbers, possibly to partial elimination of the zygotes.

Attention is called to the evolutionary importance of the restitution of the normal chromosome number from a hypo-normal mutant. The fact that the type resulting from such chromosome substitution in this case differs from the original leads to the conclusion that the 42 chromosomes of *T. vulgare* are not a trebled set of 14 as supposed by Winge but that each of the three genomes is different. Apart from this the results agree with Winge and Huskins.

838. CRESCINI, F. 633.11:575.3
Cambiamento di sementi e modificazioni indotte. (**The change from winter to spring types and induced modifications.**)
Z. Zücht. 1935 : A 20 : 492-502.

It has long been held that prolonged cultivation of a crop on the same piece of land leads to degeneration of the plants. As the assumption is difficult to prove the following experiments represent an indirect attack on the problem of whether modifications induced by external conditions are transmitted to the progeny.

Three varieties of *vulgare* wheat, 2 winter forms and 1 spring form were grown under low temperature during the ripening period. The grains so obtained were sown in the spring and the resultant plants shewed a complete adaption to the conditions of spring sowing. It remains to be seen whether such adaptation is inherited.

839. 633.11:575.42:551.566.3(47)
(**New varieties of northern spring wheat.**)

Semenovodstvo (Seed Growing) 1935 : No. 8 : p. 39.

Several new varieties are described which excel Novinka in yield and other qualities. For the Leningrad zone the following are recommended :—

TZA/32, a pure line selection from Huron, outyielding Novinka by 18 per cent in the results of 20 experiments and equal to it in quality, though it is 3-4 days later in ripening.

T70 B/8, a selection from Preston, a mid-early strain exceeding Novinka in yield by 3-5 centners per ha.

DS 1774, a selection from Australian Aurora; a late variety ripening 9-10 days after Novinka but exceeding it in yield.

DS 1801, a selection from a Svalöf spring x winter cross, Kolben x Schlanstedt, later than Novinka but exceeding it in 1933 by 34 per cent, i.e. 12.47 centners per ha against 9.27.

840. SŁABOŃSKI, A. 633.11:576.16:578.088.1(43.8)
O oznaczaniu polskich odmian pszenicy na podstawie cech ziarna i młodych roślinek. (**Distinguishing Polish varieties of wheat by the characteristics of the grains and the seedlings.**)

Roczn. Nauk Rol. 1935 : 35 : 415-43.

The Polish varieties of wheat examined could be grouped according to the colour of the coleoptile, the degree of pubescence on the sheath of the first foliage leaf, the growth habit, the natural colour of the grain and the colour of the grain on treatment with phenol. On the basis of these characteristics a key was drawn up by means of which the wheats can be assigned to their group and often even the particular varieties can be identified.

841. ELLENHORN, J. E. 633.11 *T. monococcum*:576.312.34
(Investigation of the morphology of wheat chromosomes. I. Morphology of the chromosomes of *Triticum monococcum* L.)
 Bull. Appl. Bot. Leningrad 1935 : Ser. 2 (8) : 93-98.

The chromosomes were examined by Levitsky's method, and a report is given on the success of various modifications of the proportions of the formalin and chromic acid in the fixative. The method was not entirely successful in that no metaphase was found in which all chromosomes were equally sharply defined.

Measurements were obtained however for all chromosomes and the data are tabulated. In respect of the secondary constrictions 9 types of chromosome were observed. However, as one of the types differs from another only in the absence of a satellite and another pair differs only in respect of the presence of one secondary constriction it is thought probable that the differences are due to failure to observe the satellite and constriction respectively and that only 7 types in reality exist.

These results are compared with those of Kagawa and others.

842. YAMAZAKI, Y. 633.11:576.356.52:576.354.46
(Cytological studies on haploid wheat plants).
 Jap. J. Genet. 1935 : 11 : 314-15.

A note on chromosome behaviour during microspore formation in some haploids found among hybrids of *Triticum vulgare*.

Evidence of a tendency to pairing was observed in diakinesis and a number of bivalents and trivalents was seen at metaphase I.

The percentage of haploid plants discovered, among 211,600 hybrids was 0.025 per cent and among 33,600 non-hybrid plants, 0.029 per cent.

843. PISSAREVA, A. V. 633.11:581.162.3:578.08
(The technique of crossing wheats).
 Bull. Appl. Bot. Leningrad 1935 : Ser. A (14) : 47-53.

A series of pollinations was made at Detskoe Selo near Leningrad, of the same varieties (Tulun, a selection from a mixed population of Preston, pollinated by a Finnish variety Ruskea) under different conditions. Firstly, 20 ears were emasculated on 22nd July and pollinated on 24th July at different times during the day. Pollinations at 10 a.m. gave 31 grains from 82 flowers pollinated, i.e. 38 per cent success. Pollinations at 11 a.m. gave 58.0 per cent success, those at 2 p.m. 26.0 per cent and those at 4 p.m. 42 per cent. It is clear that morning and evening pollinations give the best results though successful pollination can be effected all through the day, with the exception of the very hottest time about 12 to 3 p.m.

Secondly the variety Kitchener was emasculated on 19th July and pollinated with pollen of the variety Tulun. Pollen freshly collected on 21st July applied at 10-11 a.m. gave a percentage success of 63.25. Further pollinations with the same pollen at 2-3 p.m. gave a much lower success, and at 5 p.m. no set at all, the pollen having by that time quite dried up. Similar results were obtained in the reciprocal cross. The pollen was kept under ordinary atmospheric conditions in parchment bags and it is clear that under such conditions it loses its viability in a few hours. If pollen is to be kept it must be placed therefore not in parchment but in dark glass bottles and care must be taken not to heat them unduly by contact with the hands.

Thirdly pollination was carried out with whole stamens of different degrees of maturity. Stamens of a bright yellow colour, about to dehisce, gave 81.66 per cent success, stamens of a canary yellow colour 72.5 per cent, and fully developed but still green stamens 13.75 per cent.

Lastly ears of Tulun were emasculated every day from 19th July to 28th July and all pollinated together on 29th July at 9 a.m. with fresh Ruskea pollen. The best results were obtained from ears emasculated 2-3 days previous to pollination. The ovaries retained their viability during 10 days.

In view of the difficulties and low percentage success of pollinations made in the field it is recommended that wherever possible crossing should be carried out in a greenhouse, where a success of 80-100 per cent has been obtained by the writer.

844. JASNOWSKI, S. 633.11:581.46:575.11
 O dziedziczeniu niektórych cech kłosa pszenicy. (**On the inheritance of some characters of the ear of wheat**).
 Bull. Acad. Polon. Sci. Lettres, Cracovie 1935 : 199–218.

Studies on the progeny of crosses between the varieties Suska and Chinese, and Hildebrandt's and Chinese indicated that three pairs of cumulative factors were involved in the determination of weight of grain, the different varieties being represented thus : Suska *aaBBcc*, Chinese *AAbbcc*, Hildebrandt's *AABBCC*.

Two pairs of cumulative factors were concerned in the number of grains per spikelet and in the number of spikelets per ear.

In the F_2 of the cross Chinese x Hildebrandt's the following correlations were observed : between number of grains per spikelet and number of spikelets per ear, disregarding sterile spikelets, $+0.47 \pm 0.04$, between number of grains per spikelet and weight of ear $+0.65 \pm 0.03$ and between weight of ear and number of spikelets $+0.192 \pm 0.05$, becoming $+0.64 \pm 0.03$ when sterile spikelets are disregarded.

845. VINOGRADOVA, E. 633.11–1.524.4(47)
 (**The local winter wheats of the Leningrad district**).
 Semenovodstvo (Seed Growing) 1935 : No. 6 : 27–31.

The botanical composition of the wheats collected from the various regions of the Leningrad district and White Russia is described. Selected lines from these local wheats are being examined for frost resistance, grain weight, tillering and grain yield and some of the results are tabulated. In frost resistance they compare favourably with the wheats of other countries and even with the wheat-rye hybrids. Some of these lines are promising also in the other respects considered and certain ones exhibit tolerance of excessive soil humidity, and of other unfavourable growth conditions. These wheats are therefore promising both for selection and hybridization and some of the best selections are being multiplied for distribution.

846. RYŽIKOV, D. and LAVROVA, V. 633.11–1.524.4(47.7)
 (**The question of regional distribution of the varieties of winter wheat in the arid steppes of the Ukraine**).

Seleksija i Semenovodstvo (Breeding and Seed Growing) 1935 : 1/9 : 24–28.

The selected varieties Ukrainka and Novokrymka have proved inferior to the local wheat, known as Krymka, both in winter-hardiness and drought resistance, the local wheat being clearly better adapted to the climatic conditions. It yields quite highly, its quality is equal to the other two and it is 2–3 days earlier than Ukrainka in maturity. It is naturally very mixed and by selection over 5–6 years it has been possible to isolate lines with considerably superior yield without prejudice to the other valuable characters. Measures are being taken for its rapid multiplication and at the same time a search is being made among the local wheats for still better lines.

847. KOSTOFF, D. 633.11–2:575.127
Inheritance of natural immunity in plants with special reference to production of immune varieties by interspecific hybridization.
 Ann. Acad. Tchecosl. Agric. 1935 : 10 : 389–402.

Having stated the general facts and problems of breeding for disease resistance the possibility of transferring group immunity from one plant form to another by intra- or interspecific, or by intergeneric hybridization is considered. Earlier work on the particular problems of *T. vulgare* x *durum* and *T. vulgare* x *T. monococcum* crosses with the object of transferring rust resistance to the *vulgare* wheat is mentioned with special reference to the sterility of the hybrid from the *T. vulgare* x *monococcum* cross.

To avoid the difficulty of this sterility the author first crossed *T. dicoccum* ($n = 14$) with *T. monococcum* ($n = 7$). The F_1 , which normally is sterile, on pollination with *T. vulgare* pollen set seeds from which hybrids were produced containing the genom of *T. monococcum* (7), both genoms of *T. dicoccum* ($n = 14$) and all three genoms of *T. vulgare* ($n = 21$). Some such plants contained instead of 42 chromosomes 43, 41, 40, 42 + fragments or 43 + fragments, the fragments

being due to crossing over between only partly homologous *monococcum* and *dicoccum* chromosomes. The conjugation which occurs between 5-7 *monococcum* and 5-7 *dicoccum* chromosomes and a similar pairing between the chromosomes of *T. monococcum* and *T. vulgare* should allow an exchange of genes.

Immune forms from the triple, partially fertile hybrids which can be obtained by selfing or back-crossing to *T. vulgare* have mostly 42 chromosomes but also 42, 41, or 43 + fragments.

A similarly immune hybrid was obtained by using the hybrid from a *T. monococcum* x *vulgare* cross in which the ♂ parent had formed unreduced gametes and the F_1 had therefore 35 chromosomes and was partly fertile. The F_2 plants had from 30-33 chromosomes, were mostly highly fertile and shewed great variation as did also the F_3 , of which many forms crossed with other *Triticum* species. All these forms that are of normal fertility and immune can be used in breeding immune varieties, provided always that a *monococcum* in which immunity is dominant is used in the first instance.

Successful crosses were obtained between *T. Timopheevi* and *T. vulgare*, *T. compactum*, *T. persicum*, *T. monococcum*, *T. Spelta*, *T. sphaerococcum* and *Haynaldia villosum*. All the hybrids with other *Triticum* species are self-sterile, though very occasionally a single seed was formed, usually in the 28 chromosome hybrids; and low fertility and pairing between one genom of *Timopheevi* and the genoms of the other species limit the practical utility of this method of producing desirable types.

When *T. Timopheevi* was crossed with other 14 chromosome species, seven (and more) bivalents were formed and there were usually less than 14 univalents; while in the cross with *T. persicum* even 13 bivalents have been seen. Finally, *T. Timopheevi* crossed with 42 chromosome species most frequently shewed conjugation of one of its genoms, the other remaining single.

Hence if immunity is localized in the non-conjugating genoms its introduction into another species remains problematic. Further experiments are contemplated including an investigation of certain polyploid forms in which the non-conjugating genom is doubled.

Fully fertile forms obtained by repeated back-crossing of F_1 (*Triticum vulgare* x *Secale cereale*) to *T. vulgare* were found as a rule to have 42-44 chromosomes and several very small chromosomes or fragments, presumably due either to crossing-over between minute homologous segments of *Triticum* and *Secale* chromosomes or to segmental interchange between non-homologous chromosomes. The possibility of recombining characters by such intergeneric crosses so as to produce immune forms is, however, very small.

The success achieved in producing immune forms by vegetative propagation and the establishment of clones is exemplified by reference to well-known work on sugar cane.

848. SUNESON, C. A. 633.11-2.111-1.521.6:578.081

Controlled hardness studies.

Rep. 3rd Hard Red Winter Wheat Impr. Conf. Nebraska 1935 : 14-16.

(Mimeographed).

Studies on the method of testing susceptibility to low temperatures by controlled freezing have not shewn varietal response to be dependent on the level of tolerance e.g. of field plants as against greenhouse plants, nor entirely dependent on the temperature to which the plants are accustomed. It is, however, affected by stage of growth, infection by bunt, place of origin of seed and seasonal effects.

The method has been used in selection work and strains of standard varieties considerably more cold resistant than the varieties themselves have been developed without impairing their agronomic qualities.

A co-operative programme using this method is suggested.

849. ATKINS, I. M. 633.11-2.183-1.521.6:575

A study of the relationship of some morphological characters to strength of straw and lodging in winter wheat.

Rep. 3rd Hard Red Winter Wheat Impr. Conf. Nebraska 1935 : 25-27.

(Mimeographed).

Correlation studies with a large number of varieties shewed breaking strength of straw to be closely correlated with diameter of culm, weight of culm, weight of a section of culm (density),

weight of heads, weight of grain and, to a lesser degree, with height of plants and length of lower internode. No correlation was found between strength of straw and lodging. The extremely high correlation obtained between breaking strength and density of culm shews that the latter is as good a measure of strength of straw as the direct determination.

The inheritance of strength of straw is being studied in a cross between a short weak strawed variety and Clarkan, a tall strong strawed variety, and it is hoped to secure a strain combining standing power with high tillering and yielding capacity. In the discussion it is stated that it has been found easier to select short strawed wheats which are strong than long strawed ones.

850. DUNKLE, P. B. 633.11-2.183-1.521.6:575

Shattering in winter wheat.

Rep. 3rd Hard Red Winter Wheat Impr. Conf. Nebraska 1935 : 28-30.

(Mimeographed).

A machine is mentioned which will shatter individual heads of wheat in a manner similar to that which occurs normally in the field. Details are not given but it is stated that they will be supplied to those interested.

Correlation studies shewed that the most important factor affecting shattering as measured by the machine was awn length which gave a correlation of -0.61. A negative correlation was also obtained with number of grains per head and a positive correlation with width of grain.

In the F_2 of Clark 40 x Fulcaster the amount of shattering appeared to decrease as length of awns increased. The cross Fulcaster and Blackhull is also being studied.

851. JOHNSTON, C. O. 633.11-2.4-1.521.6:578.081(78.1)

Wheat disease garden.

Rep. 3rd Hard Red Winter Wheat Impr. Conf. Nebraska 1935 : 34-35.

(Mimeographed).

The wheat disease garden which is maintained at Manhattan, Kansas in connexion with hard red winter wheat improvement is briefly described.

Observations are made on reaction to bunt, loose smut, rusts, mildew and speckled leaf blotch (*Septoria tritici*). No artificial inoculations have been made except with bunt.

852. CHEN, H. K., HWANG, L. and YU, T. F. 633.11-2.451.3-1.521.6:575(51)

(Experiments in controlling flag smut of wheat).

Bull. Coll. Agric. For. Nanking 1933 : No. 2 : (N.S.) : Pp. 14.

Resistance tests lasting 6 years have revealed several foreign and Chinese varieties resistant to flag smut, and a few practically immune. Yield and quality investigations are still in progress.

853. MANGELSDORF, P. C. 633.11-2.452-1.521.6:575

Breeding for rust resistance.

Rep. 3rd Hard Red Winter Wheat Impr. Conf. Nebraska 1935 : 13-14.

(Mimeographed).

From crosses of Hope and the leaf rust-resistant strain Mediterranean 3015-63, varieties are being developed combining resistance to stem and leaf rust, which are limiting factors in wheat production in South Texas. Resistance to stem rust appears to be recessive in this cross, and, though it appears to be linked with susceptibility to black chaff and *Septoria*, segregates resistant to all diseases have been isolated.

It is suggested that it should be possible to develop along similar lines multiple factor foundation stocks combining resistance to many diseases with other desirable characteristics.

In the discussion following the paper the question of winter-hardiness was mentioned. It was also reported that in crosses with Hope and H-44 it has been found difficult to get a hybrid as high yielding as the parent form used.

854.

633.11-2.452-1.521.6:575(47)

633.11 H-622

633.11 H-43

633.11 H-51

LUK'JANENKO, P. P.

(Rust-resistant varieties of winter wheat).

Selektsija i Semenovodstvo (Breeding and Seed Growing) 1935 : 2/10 : 52-55.

Brief descriptions are given of certain new rust-resistant wheat hybrids produced at the Krasnodar breeding station.

H-622, var. *ferrugineum*, obtained from a cross between Marquis and *ferrugineum* 013, is highly resistant to brown rust, giving an infection of 0-5 per cent under conditions which infected the local standard, Ukrainka, up to 100 per cent. It has greatly outyielded Ukrainka in severe rust years and almost equalled it in rust-free years. It is slightly superior to Ukrainka also in baking quality and is possessed of good strong straw. It is still impure for certain characters and some of the selections from it are superior to it in uniformity of type and also in cold and drought resistance, which still further enhances the yield. The new variety matures 3-4 days earlier than Ukrainka and is almost free from shedding.

Two further varieties resistant to both stem and brown rust and derived from the cross *ferrugineum* 013 x Kitchener are described ; they are also resistant to smut (*Tilletia tritici*) and are still higher in yield than the hybrid H-622, especially in dry years, and their quality is good ; *erythrospermum* H-43 is mid-early, ripening one day later than Ukrainka, the other, *ferrugineum* H-51, is invariably four days earlier than Ukrainka. The standing capacity of both hybrids is moderate and H-43 is free from shedding.

855.

JOHNSTON, C. O.

633.11-2.452-1.521.6:575(73)

The rusts of wheat.

Rep. 3rd Hard Red Winter Wheat Impr. Conf. Nebraska 1935 : 33-34.

(Mimeographed).

Stem rust and leaf rust are the only important rusts in the hard red winter wheat area. They overwinter in Texas and advance northward as environmental conditions become more favourable. Rust-resistant wheats for Texas would therefore not only give that state more stable yields but would also be beneficial to states further north in reducing the amount of inoculum.

The problem of breeding such wheats is simplified by the fact that only a few physiological forms of each rust appear to occur in abundance each year, notably form 18 and 36 of stem rust and 9 and 19 of leaf rust, that resistance to several forms is often determined by the same genetical factor and that many of the physiological forms are indistinguishable as far as the commercial wheats are concerned.

A list of the varieties of common bread wheats possessing leaf rust resistance is given. Many resistant hybrids from crosses between *vulgare* varieties are available for study. Interspecific crosses have been avoided because of sterility and possible linkage.

856.

HART, H. and ZALESKI, K.

633.11 Hope:632.452-1.521.6:581.03

The effect of light intensity and temperature on infection of Hope wheat by *Puccinia graminis tritici*.

Phytopathology 1935 : 25 : 1041-66.

In investigating the nature of the difference in reaction of Hope wheat to *Puccinia graminis tritici* form 21 in the susceptible seedling and in the mature resistant plant it was found that light intensity had a profound effect on the reaction of the mature plant. Whereas in the normal intense sunlight of the Upper Mississippi Valley the usual "mature plant resistance" of the variety was exhibited under artificial inoculation, when the light intensity was reduced mature plants became almost as susceptible as seedling plants.

High temperature had an effect similar to that of intense sunlight.

In discussing the results it is emphasized that the environmental factors, light and temperature, appear to be acting in this case on the host-parasite complex rather than on its individual parts.

857. PAINTER, R. H. 633.11-2.7-1.521.6:575(78.1)
632.7:576.16
Resistance of wheat to Hessian fly.
Rep. 3rd Hard Red Winter Wheat Impr. Conf. Nebraska 1935 : 38-41.
(Mimeographed).
Studies at Manhattan, Kansas have indicated that varieties differ greatly in their susceptibility to the Hessian fly. Some strains of varieties which appear pure in agronomic characters have been found to differ in their susceptibility.
There may be definite resistance to the fly as in the variety Illini Chief in which larvae reaching the base of the culm are unable to commence feeding, or the reaction may take the form of tolerance as in Blackhull, while other varieties, though susceptible, differ in their ability to recover from an infestation.
Inheritance studies on a large number of crosses have shewn definitely that resistance is inherited, the number of factors concerned being not less than three and probably more than five. The different types of resistance mentioned above are governed by different factors. Resistance does not appear to be associated with any of the commonly observed agronomic characters.
There is reason to believe that there are two or more biological strains of the fly.
The variety Marquillo is the only common or bread wheat type which has so far been found to exhibit any considerable resistance to populations of fly in both wheat belts of Kansas, which appear to differ in the dominant biological strain of fly. Crosses of this spring variety with several winter varieties have shewn that resistance is inherited independently of the spring habit and it is hoped to fix the Marquillo type of resistance in winter segregates from these crosses.
In different species of *Triticum* it appears that in general those with lower chromosome numbers are less susceptible.
858. MOLLE, P. 633.11:664.641.016(44)
Cinq ans de recherches sur la valeur boulangère des blés. Le centre d'expérimentation de la valeur boulangère des blés à Crest (Drôme). [**Five years of research on the baking quality of wheats. The experiment centre for baking quality of wheats at Crest (Drôme).**]
Sélectionneur 1935 : 4 (2) : 55-63.
An outline is given of the history, origin, equipment and methods of this experiment centre and the results so far obtained in investigating the relative importance of variety and environment as factors affecting baking quality in various wheats consisting mainly of those produced and grown in France.
859. MIÈGE, E. 633.11:664.641.016(64)
Recherches sur la qualité des blés. Récolte 1934. (**Researches on the quality of wheats. 1934 harvest.**)
Rabat, 1935 : Pp. 114.
A detailed study of the baking value of the Moroccan wheats harvested in 1934. In spite of the unfavourable season the quality of the wheats was well maintained and the selected varieties, now cultivated on nearly 95 per cent of the area devoted to wheat, shewed their superiority over the indigenous and ordinary varieties.
The baking quality was considerably influenced by the locality. Besides the differences due to the variety a number of other factors are studied for their effect on baking value, including the soil, manures and insecticides.
860. FIFIELD, C. C. 633.11:664.641.016:575
Baking quality of the hard red winter wheat varieties.
Rep. 3rd Hard Red Winter Wheat Impr. Conf. Nebraska 1935 : 10-12.
(Mimeographed).
The behaviour of certain winter wheat varieties in baking tests is briefly discussed. It is mentioned that some of the more promising Turkey selections and Kanred crosses are equal to the standard varieties in baking performance.

861. SCHNELLE, F. and HEISER, F. 633.11:664.641.016:575(43)
Die Qualität des Weizens in der Provinz Sachsen und im Freistaat Anhalt.
Nach Untersuchungen der fünf Weizenernten 1930-1934. (**The quality of
wheat in the Province of Saxony and in the Free State of Anhalt. From
investigations on the five wheat harvests 1930-1934.**)
Kühn-Arch. 1935 : 39 : 323-38.

A study of the relation between quality and place of origin in wheat with special reference to Saxony and Anhalt, observations having been obtained from numerous localities (200 a year on an average) in these two provinces.

The internal differences in quality that were induced by environmental factors proved relatively slight as compared with those due to varietal characterization and it is the hereditary constitution which limits the degree of improvement in quality that can be attained by bettering the external conditions of the plant.

862. ENGELKE, H. 633.11:664.641.016:578.081
Die Bedeutung der Mikromethoden zur Feststellung der Weizenqualität nebst
Beschreibung einer neuen Mikromethode. (**The importance of micro-
methods for the determination of quality in wheat and the description
of a new micro-method.**)
J. Landw. 1935 : 83 : 89-106.

The micro-apparatus and method for the determination of baking quality based on the principles of the Göttingen technique (Cf. "Plant Breeding Abstracts," Vol. V, Abst. 342) are described. Only 2.2 grm. of grain are needed and by such means the value of pure lines and the degree of homozygosity in the progeny of crosses can be determined and the method offers many practical advantages to the plant breeder.

863. MENERET, G. 633.11:664.641.016:578.081
Méthode "Pelshenke" et extensimètre. (**The Pelshenke method and the
extensimeter.**)
Sélectionneur 1935 : 4 (1) : 40-45.

A comparison based on some results obtained by the Pelshenke method and the Chopin extensimeter in determining wheat quality at the plant improvement station at Colmar.

The Pelshenke method is regarded as preferable.

864. QUISENBERRY, K. S. 633.11.00.14(73)
The regional program.
Rep. 3rd Hard Red Winter Wheat Impr. Conf. Nebraska 1935 : 31-32.
(Mimeographed).

The results of certain of the uniform trials conducted throughout the hard red winter wheat region of the United States of America are briefly reported.

In the winter-hardiness nurseries *lutescens* is at present the outstanding variety.

Yields are measured in uniform plot tests, preliminary indications being obtained in uniform yield nurseries.

Various disease nurseries are also maintained.

OATS 633.13

865. 633.13 No. 339 2/24
633.13 No. 26-1363
633.13:575(47)

BESPALOV, I. K.
(**New varieties of oats.**)

Selektsiya i Semenovodstvo (Breeding and Seed Growing) 1935 : 2/10 : 58-59.

Two new varieties of oats, 339 2/24 and 26-1363 are shown by tabulated data to be superior to the standard varieties Victory and A-315 in yield, grain weight, thinness of husk and resistance to rust, having an attack of not more than 25 per cent compared with 47-52 per cent in Victory. They are later than Victory by 2-3 days, which is regarded as an advantage rather than a disadvantage.

866. STANTON, T. R.
Registration of varieties and strains of oats, VII.
 J. Amer. Soc. Agron. 1935 : 27 : 1001-02.
 A description is given of the new winter oat variety Support, which resembles the variety Winter Turf in many respects but is slightly earlier and has outyielded it by an average of 12 bushels per acre during the 5 years 1927-1931 at the Oregon Experiment Station, Corvallis. It is not certain whether Support is of hybrid origin or not.

633.13 Support
 633.13:575(73)

RYE 633.14

867. MIKHAILOVA, E.
(Winter rye "M-4").
 Semenovodstvo (Seed Growing) 1935 : No. 8 : 34-35.
 Petkus rye having proved superior to the local rye both in yield and quality, selection was started to produce a strain capable of growing in the light soils of the Novozybkov district. The material taken was Petkus rye that had been growing at the station for a number of years in the vicinity of plots of local rye and by mass selection a line M-4 was produced which in comparative tests proved to be equal to Vjatka in winter-hardiness and in yield. The results of tests at a number of different places are tabulated. The new variety is free from shattering and has straw of good fodder value and further selection is expected to improve its uniformity in external appearance, standing capacity and other features in which it is at present deficient.

633.14 M-4
 633.14:575.42(47)

868. DERŽAVIN, A. I.
[Further data on the perennial rye *Secale Kuprijanovi* Grossh, and its agricultural value (On the history of the study of perennial rye (*Secale Kuprijanovi*)).]
 Bull. Appl. Bot. Leningrad 1935 : Ser. A (14) : 159-65.

633.14:575"793"
 633.14 S. *Kuprijanovi*
 633.14:575.127.2

Perennial rye has been known in the North Caucasus for some time but was only established as a separate species distinct from *S. montanum* in 1928 by Grossheim, who named it *S. Kuprijanovi*. Observations are reported which indicate that the local inhabitants have in the past collected the seed of this wild rye for sowing. In spite of a number of defects such as low cold and drought resistance, brittle ear, irregular maturity, susceptibility to rust, etc., it is superior to other perennial ryes in its greater earliness, size of grain, compactness of growth and its capacity to maintain its green condition even at maturity of grain. By late sowing it has even been possible to select lines which ripen when spring sown, which has not previously been possible in perennial ryes. Inbreeding is being practised and by this means certain comparatively self-fertile lines have been isolated which give 30-46 grains per ear.

A great many crosses of it with cultivated rye have also been made and the percentage successes in different crosses are tabulated. The perennial habit is dominant in the F_1 and it is thought that hybrids of this kind, combining the perennial habit with the cultivated type of grain, could be used in cultivation; the chief disadvantage up to the present is that lateness and brittleness of ear are also dominant. Large numbers of crosses are being made in the attempt to find combinations in which these undesirable features are absent and at the same time to utilize the phenomenon of heterosis. For the purpose of making these crosses on a mass scale it is necessary to adjust the time of flowering, cultivated rye being about 10 days earlier than *S. Kuprijanovi*; this is achieved either by sowing the latter in spring after vernalization or by cutting down the cultivated rye at the time when the stems begin to elongate.

S. Kuprijanovi has possibilities as a forage plant and breeding for this purpose is recommended too.

869. *DUKA, S. KH. 633.14:575.127.2:576.312
(Cytogenetic research on the interspecific hybrids *Secale vulgare* x
Secale montanum).
Bull. Appl. Bot. Leningrad 1935 : Ser. A (14) : 233-38.

In order to test whether it was possible to combine the desirable characteristics of *S. vulgare* with the perennial habit, tolerance of low temperature and general hardiness of *S. montanum*, crosses were made between the two species. Petkus winter rye, representing *S. vulgare*, was used as the female parent and was cut back two days before fully earing to delay its development until the pollen of *S. montanum* should have matured.

From a total of 1,620 flowers pollinated 17 seeds developed normally.

The F₁ hybrids were all more or less intermediate and uniform, 80-100 cm. high, with glabrous ears which were brittle and more like those of *S. montanum* and had a bristly appearance at flowering time. The leaves were densely covered with hairs on the upper surface. The hybrids were late in maturing and out of 42 normally developed ears (with 1,532 spikelets) only 15 ears set seed with an average of about 44 normal grains which were of a good size and relatively well-filled.

The seeds from the F₁ yielded 26 plants which developed more or less normally, the rest dying off at various stages.

In the F₂, segregation was observed for ear characters, brittleness, pubescence of the leaves, type of stem, growth and general development, perennial and annual habit and many other features.

A study of the F₂ material indicated that perennial habit behaved as a recessive character and that from crosses made on a large scale cultivated perennial rye types can be obtained by selection. Brittleness of the ear appeared to be dominant to toughness, though some medium tough ears were also observed in the F₂. The type of ear and awns of *S. montanum* was dominant, as were also glabrousness under the ear and pubescent leaves, though in the latter case segregation was not clear-cut and inheritance is probably complicated.

A cytological examination of the first hybrid generation shewed irregularity at all stages of the first and second division and abnormalities in the number of bivalents formed and in chromosome separation to the poles, resulting in the formation of pollen which was irregular in the number of its chromosomes and in size and form. Its viability varied from 5-38.3 per cent.

870. KRASNIUK, A. A. 633.14:575.14
(Fertility of rye at inbreeding).
Socialistic Grain Farming, Saratov 1935 : No. 4 : 84-87.

The loss of yield from empty florets in the normal method of propagating rye is estimated at 25 to 30 per cent ; the percentages observed in a number of the best known varieties are tabulated. It is possible that this, like other undesirable features, can be diminished by inbreeding.

One of the difficulties of isolating self-fertile lines is that, as the author's hybridization experiments have shewn, self-fertility is dominant and purity can therefore only be attained after a number of generations. Experiments to compare the amount of fertility under bags with that obtained by open pollination were made in 1933 by putting one half of each ear in a bag and leaving the other half free. Material in different stages of inbreeding from the first to the seventh generation was examined. The average fertility in the inbred series increased progressively with the generation of inbreeding, from 8.2 per cent in the first to 26.1 in the seventh generation ; the average fertility of the free-pollinated series remained about the same, varying only from 52.8 to 53.7 per cent in the different years ; however if the fertility of the individual cultures was compared it was seen that those with a high fertility in the bagged half were characterized by a correspondingly high fertility in the free-pollinated half, this latter rising to 80 per cent and even in some cases to as much as 100 per cent. Thus it is recommended that lines with favourable qualities and high fertility when bagged should be used for the selection of improved varieties.

871. TAKAGI, F. 633.14:576.356.4

Karyogenetical studies on rye. I. A trisomic plant.

Cytologia, Tokyo 1935 : 6 : 496-501.

Though the plant in question was derived from a 15 chromosome plant which had a small *K*-chromosome in excess of the normal complement, it itself had no *K*-chromosome but had three chromosomes with two constrictions.

At first metaphase of meiosis in the pollen mother cells sometimes $6_{II} + 1_{III}$, sometimes $7_{II} + 1_I$ and rarely $6_{II} + 3_I$ were found. When a trivalent occurred the anaphase was fairly regular, 7 chromosomes going to one pole and 8 to the other and all being included in the daughter nuclei at interkinesis; little or no chromosome elimination then occurred at second metaphase. When univalents occurred, however, behaviour was less regular. They sometimes passed at random to one pole or the other at first metaphase, often failing to be included in the daughter nuclei. When they divided equationally at the first division they again often failed to enter the daughter nuclei and formed micronuclei at interkinesis.

The trisomic plant was very weakly in appearance but its fertility was fairly good and seeds were obtained from it, which developed into phenotypically normal plants.

872. BLEICHERT, H. V. 633.14.00.14

Kritische Untersuchungen zur Unterscheidung deutscher Winterroggensorten an Hand grundlegender Untersuchungen von H. Schröder und des von den Sortenregisterstellen für Roggen gesammelten Materiales. (**Critical investigations of the differentiation of German winter rye varieties—by the aid of basic investigations of H. Schröder and the material collected from the variety registration centres for rye.**)

Z. Zücht. 1935 : A 20 : 443-74.

The work was done on 39-50 varieties of rye during the period 1930-34.

Fifteen characters were used to distinguish the varieties but the cross-pollination of rye makes such work extremely difficult and mostly it was found that the differences between the varieties were very small and the fluctuation in the expression of the characters very great.

Only very few varieties are easily distinguishable and most of the commercial varieties after 3-5 years testing lost their individual characteristics.

873. JUNG, E. 633.14.00.14:581.162.32

Untersuchungen über die Variabilität und Eigenschaftsangleichung zweier Roggensorten bei geregelter Vizinismus. (**Studies on the variability and approximation of the characters of the varieties of rye under controlled vicinism**).

Z. Zücht. 1935 : A 20 : 475-91.

As a result of sowing two readily distinguishable rye varieties in alternate rows for three years the morphological and other characters of the progeny shewed an approximation to those of the parent varieties which was relatively most marked in the first year.

MAIZE 633.15

874. KOŽUKHOV, I. V. and ŠUNDENKO, S. N. 633.15:575

(**The quality of maize cobs selected for seed**).

Seleksijska i Semenovodstvo (Breeding and Seed Growing) 1935 : 2/10 : 77-78.

The main points in choosing seed cobs are that the plants from which they are taken should be healthy, upright, suitable in time of maturity, with cobs borne at a suitable height and pendent, large and preferably more than one per plant. The rachis should be firm and colourless and the cobs should bear grain uniform in colour and form, bright, fully mature and healthy.

875. KRUG, C. A. 633.15:575
 Metodos de melhoramento e conhecimentos atuais da genetica do milho.
 (Methods of improvement and present knowledge of the genetics of
 maize).
 Rev. Agric. S. Paulo 1933 : 8 : (11/12) : 479-96, also Bol. Tec. Inst. Agron. S.
 Paulo 1934 : No. 10 : Pp. 79.

A Master's thesis in which the state of knowledge at the date of its presentation in 1932 is reviewed in some detail, starting with the phylogeny and passing on to the chief methods of improvement, which are separately described, and the methods of breeding for special objects such as resistance to a number of diseases, insect pests, cold and lodging ; and lastly the production of lines with uniform ripening and of lines suitable for silage. The genetics and cytology of maize are reviewed much more briefly, a table of the known genes being given indicating the characters they affect and the linkage groups to which they belong. Finally the application of the genetical and cytological work to practical breeding is briefly discussed and a bibliography of 106 references is appended.

876. EYSTER, W. H. and EYSTER, H. C. 633.15:575.11
 Genetic variations in a commercial field of maize.
 Amer. Nat. 1936 : 70 : p. 49. (Abst.)

From material taken in a single field of maize 35 different characters have already been found, affecting seedlings, kernels, leaves, culms, ears and tassels.

877. HOROVITZ, S. 633.15:575.11
 Algunos problemas de genetica del maiz. (Some problems of maize
 genetics).
 Jornadas Agronómicas, B. Aires 1934 : 297-313.

The centre of maximum diversity in maize is found in Peru and Bolivia but also in the north of the Argentine Republic there occur innumerable local races, each confined to a very limited territory. The most widely cultivated commercial types are imported however.

A genetic analysis has been made of some of the types. They all owe their uniform white grain colour to the presence of an inhibitor *I* and the majority are also recessive for one of the basal colour factors *r*. Their constitution with respect to other grain factors is briefly outlined. All known allelomorphs of *R* for aleurone colour are present, and a sugary form, similar to the North American sweet maizes, has been found among the hill types of Peru and Bolivia, though it never occurs in the plains. Combined with a much greater diversity of characters, the hill forms also shew a marked tendency to dominance, as opposed to the lowland forms, which possess preponderantly recessive characters. Owing to the prevalence of cross-pollination under the conditions of cultivation in the plains these forms produce a much greater variety of (recessive) segregates on inbreeding than do the hill forms.

The "amargo" type grown in the north of Argentina is valuable on account of its resistance to locust attack. That the resistance is hereditary is thought probable by analogy with the inheritance of corn borer resistance in the same variety (Cf. "Plant Breeding Abstracts," Vol. I, Abst. 360, Vol. II, Abst. 435) and the alleged loss of resistance in certain cases in cultivation is ascribed to out-pollination. Experiments are being made to transfer the resistance of Amargo to other commercially desirable varieties by the method of repeated back-crossing, with alternate generations of self-pollination because of the recessive nature of the resistance factor, selecting continually for the most resistant segregates. To ensure the continued purity of the resistant form when obtained, certain easily detectable recessive morphological characters are to be combined with the amargo character, so that chance hybrids can be immediately recognized.

Use is to be made of the character "male sterile" in obviating the necessity for emasculation in making double crosses, and so considerably reducing the expense of the work. Various such "male sterile" genes, analogous to *ms*₁, have been found in the Argentine maizes and their linkage relations are being studied.

878. EMERSON, R. A., BEADLE, G. W. and FRASER, A. C. 633.15:575.113:575.116

A summary of linkage studies in maize.

Mem. Cornell Agric. Exp. Sta. 1935 : No. 180 : Pp. 83.

A very concise account of the genes known in maize, which now number over three hundred. An alphabetical list of them is given and then a list of the 10 independent linkage groups and the genes known to belong to them with numerical data on their linkage relations. Chromosome maps are also given shewing the loci of those genes whose position in the ten chromosomes can be determined with reasonable certainty.

The material presented, which has been compiled from the published and unpublished results of many workers, shews that the knowledge of the genetical factors of maize is rapidly approaching that of *Drosophila*.

879. HAYES, H. K. 633.15:575.116.061.6

Virescent seedling linked with japonica in group 8.

Amer. Nat. 1936 : 70 : p. 52. (Abst.)

The recessive factor producing vigorous virescent seedlings of maize originally appearing in an inbred line of Minn. No. 13 dent maize was found to be genetically different from ten other virescents designated $v_1, v_2, v_3, v_4, v_5, v_{12}, v_{15}, v_{17}, v_{18}$ and v_{20} . In repulsion with japonica (j) in group 8 the following F_2 data were obtained : VJ 443 : Vj 165 : vJ 173 vj 7. The three-point relationship between this virescent, japonica and male sterile_a is being studied.

880. EYSTER, W. H. 633.15:575.116.4

Revised linkage maps of chromosomes 5 and 9 in maize.

Amer. Nat. 1936 : 70 : p. 49. (Abst.)

Approximate loci are given (in the original paper) of more than 30 genes in chromosome 9 and about 20 in chromosome 5.

881. ARNASON, T. J. 633.15:575.127.5:576.354.46:575.116.12

Cytogenetics of hybrids between *Zea mays* and *Euchlaena mexicana*.

Genetics 1936 : 21 : 40-60.

The purely cytological part of the investigation was largely carried out on hybrids of maize with the Florida variety of annual teosinte (*E. mexicana*), crosses also being made with the teosinte variety Durango. The maize stocks used included normal maize and stocks homozygous for different reciprocal translocations.

At diakinesis and first metaphase of meiosis in the F_1 hybrids of normal maize with Florida teosinte an unequal open or end-to-end pair sometimes appearing as two univalents could be distinguished in 50 per cent of the cells and a somewhat larger unequal pair was detected in 20 per cent of the cells; the rest of the chromosomes paired to form ring-shaped bivalents. In similar hybrids with Durango teosinte no univalents were found but one or two end-to-end pairs were present in about 25 per cent of the cells examined.

It was observed that pairing and chiasma formation was normal in the sixth chromosome of maize in hybrids with teosinte, this chromosome being relatively easy to distinguish by reason of its association with the nucleolus.

Cytological evidence as to the regularity of pairing of maize chromosomes 1, 2, 5, 6, 7, 8 and 9 with the corresponding teosinte chromosomes was obtained by examining the configurations obtained when stocks of maize homozygous for translocations involving these chromosomes were crossed with teosinte. With regard to Florida teosinte chromosomes, evidence is presented that there is close correspondence with maize chromosomes 1, 2, 6 and 7 respectively and somewhat less for chromosome 5. In either 8 or 9, or both there appears to be a structural difference hindering chiasma formation with the corresponding teosinte chromosomes. There is slight, but inconclusive evidence that chromosome 5 is concerned in one of the unequal pairs observed in the F_1 hybrid. In Durango teosinte the behaviour of chromosomes 1, 2, 6, 8 and 9 was substantially similar to that observed in Florida.

Genetical crossing-over between maize chromosomes 1, 2, 3 and 7 and the corresponding teosinte chromosomes was demonstrated by crossing linkage tester stocks of maize with Florida teosinte

and backcrossing to the respective maize lines. Owing to the small numbers used the frequencies of crossing-over were not accurately determined but they appeared to be not very different from those in maize.

Cytogenetical investigations involving the ninth maize chromosome were also made using the genes *yg₂*, *sh* and *wx* at loci 0, 22 and 52 respectively, in the short arm and a translocation in the long arm. Crossing-over in the genetically marked region was much reduced, being about 5 per cent as compared to 52 per cent in maize. Moreover in a previous investigation Beadle found 12 per cent crossing-over between *wx* and the point of translocation, using the same translocation as the present worker, giving a theoretical total of 17 per cent crossing-over in one arm of the cross produced at pachytene in the hybrid of teosinte with the stock homozygous for the translocation; this should give, according to the theory that every chiasma represents a cross-over, a maximum of 34 per cent of rings of four in cells at diakinesis. Actually about 50 per cent were observed.

882. STADLER, L. J. and SPRAGUE, G. F. 633.15:575.243:535.61-31
Genetic effects of ultra-violet radiation in maize.
 Amer. Nat. 1936 : 70 : p. 69. (Abst.)

Deficiencies, translocations and point mutations were induced by ultra-violet irradiation from a quartz mercury-vapour lamp. The frequency of deficiencies marked by endosperm genes was roughly proportional to dosage, the maximum frequency being equal to that from fairly heavy X-ray treatments.

Filtration of the rays through different strengths of mercuric chloride solution indicated that wave-lengths greater than $300\mu\mu$ are ineffective.

883. BROWN, R. W. 633.15:576.16
The supposed fossil ear of maize from Cuzco, Peru.
 J. Wash. Acad. Sci. 1934 : 24 : 293-96.

The object in question is shewn not to be a true fossil but a copy.

884. REEVES, R. G. and MANGELSDORF, P. C. 633.15:576.312.35:576.16
Chromosome numbers in relatives of *Zea Mays* L.
 Amer. Nat. 1935 : 69 : 633-35.

Among the somatic numbers reported are *Tripsacum dactyloides* L., 36 and 72 in different material, *T. laxum* Nash, *T. latifolium* Hitch, and *T. pilosum* Scrl. and Merr., 72, each of these cases of 72 being considered autotetraploid. *Coix lachryma stenocarpa* Oliver, *C. lachryma-jobi* L., *Sclerachne punctata* Brown and *Polytoca barbata* Stapf each had 20 somatic chromosomes and *Manisuris cylindrica* (Michx.) Kuntze had 18.

The last named species, usually considered to belong to the tribe *Andropogoneae*, is shewn by its basic number 9 to be related to *Tripsacum* and thus forms a link between the *Maydeae* and the *Andropogoneae*.

885. JONES, D. F. 633.15:581.143.32.576.356.2
Atypical growths in maize occurring as mosaics.
 Amer. Nat. 1936 : 70 : p. 54. (Abst.)

Overgrowths in plant and endosperm tissue occur sporadically at different stages of development and with the same order of frequency as mosaics resulting from the loss of dominant genes by chromosomal aberrations.

886. SMITH, W. K. 633.15:581.192:575.113.061.5
Biochemical studies relating to the waxy gene in maize.
 Amer. Nat. 1936 : 70 : p. 68. (Abst.)

While the rate of hydrolysis of waxy starch by the enzyme α -amylase was the same as that of normal maize starch, the former shewed a higher initial rate of conversion to maltose than the latter under the action of β -amylase.

There are indications that, though both α and β -amylase are present in both waxy and non-waxy pollen, there is a qualitative difference between the two α -amylases and studies on this point are in progress.

887. EYSTER, W. H. and ROBINSON, B. A. 633.15:581.3:575.114.4
Gametophytic genes in relation to modified ratios.
 Amer. Nat. 1936 : 70 : p. 50. (Abst.)

Examples are given in the original paper of gametophytic genes in chromosome 9 (presumably of maize) causing wide modifications in the phenotypic ratios of characters having their loci in this chromosome.

888. SPRAGUE, G. F. 633.15:581.46:575.114.4
Random sampling and the distribution of phenotypes on ears of backcrossed maize.
 J. Agric. Res. 1935 : 51 : 751-58.

Maize plants of the genetic constitution *Yy Susu* were pollinated with *y su* pollen and the frequencies of the groups of 1, 2, 3 etc. grains similar in respect of yellowness (*Y*) or whiteness (*y*), starchiness (*Su*) or sugariness (*su*) were tabulated. By two statistical methods these frequencies were found to deviate from the expected random distribution, there being an excess of single grains and too few groups of three or more. On correcting however for missing grains and for the effect of length of row the distribution was found to agree with expectation.

889. FLEISCHMANN, R. 633.15:581.48:575.42-18
 Die Kornreihenanzahl an Maiskolben. (**The number of rows in maize cobs**).
 Pflanzenbau 1935 : 12 : 199-206.

Some data on the structure of the maize cob, the number of its rows and variations in length and in grains, the presence of abnormal grains, etc. are considered mainly from the morphological standpoint in so far as it may be of possible interest in questions that may arise in practical breeding. (Cf. "Plant Breeding Abstracts," Vol. VI. Abst. 542).

The relationship between grain yield, number of rows in the cob and the role of climatic adaption as a factor to be considered in deciding the optimum number of rows under given ecological conditions are also mentioned.

The results of selection experiments carried out from 1932-34 with a German variety of *Zea mays indentata* are given in the form of tables and graphs and interpreted as shewing that the mean number of cobs per cob could be influenced by mass selection.

No marked economic advantage is however thereby attained and a range of between 14-18 rows is recommended for the variety tested.

A number of other features was also observed for the existence of correlations but none of economic importance were found.

890. PAINTER, R. H., SNELLING, R. O. and BRUNSON, A. M. 633.15-2.7-1.521.6:575.125
Hybrid vigor and other factors in relation to chinch bug resistance in corn.
 J. Econ. Ent. 1935 : 28 : 1025-30.

Differences in susceptibility to chinch bug attack were noted in open-pollinated varieties of maize grown at Manhattan, Kansas and at Lawton, Oklahoma, there being a general correspondence in results at the two stations.

Differences were also noted in the susceptibility of inbred lines to first and second brood attack at the two stations, but there was very little correlation between the two sets of results. Hybrids between inbred lines were in general markedly more resistant to both types of attack. It is suggested that the ability to survive infestation may be due to either inherited resistance or to hybrid vigour or both.

BARLEY 633.16

891. PHILLIPS, C. L. and BOERNER, E. G. 633.16
Barley and barley malt. Abstracts and references. Grades, statistics, tariffs, varieties, quality requirements, uses, and related subjects, also lists of brewing journals, and manufacturers of barley malt and pearled barley.
 U.S. Dep. Agric., Bur. Agric. Econ. Grain Div., Wash. 1935: Pp. 75.
 (Mimeographed).

A compendium of information on barley compiled from many sources. An extensive bibliography is also provided.

892. KORABLIN, A. 633.16 Boets
[Boets (Warrior) Pallidum 0945].
 Semenovodstvo (Seed Growing) 1935: No. 7: 54-55.

The variety referred to was produced by the West Siberian breeding centre by individual plant selection. It is highly drought-resistant and tables of yield and other qualities shew it to be superior to the standard varieties both in moist and dry years. It can be cultivated in regions too dry for other varieties and is considered promising for regions with a mean annual rainfall of 220-350 mm. It is also frost-resistant and altogether a very promising variety.

893. ROBERTSON, D. W. and AUSTIN, W. W. 633.16:575.113.7:575.123
The effect of one and of two seedling lethals in the heterozygous condition on barley development.
 J. Agric. Res. 1935: 51: 435-40.

The genetically different factors A_{c-a_c} and $A_{c3-a_{c3}}$, producing non-viable white plants in the homozygous recessive condition and the factor pair X_{c-x_c} , linked to A_{c-a_c} and producing yellow seedlings in the homozygous recessive condition were used in the present study. No detrimental effects were observed when plants heterozygous for any one of the factors were compared with homozygous green plants in the same families, nor when the heterozygotes $A_{c3-a_{c3}}$, X_{c-x_c} and $A_{c-a_c}X_{c-x_c}$ were compared with corresponding pure green plants.

894. MIÈGE, E. and GRILLOT, G. 633.16:575.22:581.02
 Note sur les variations observées dans la nature des espèces élémentaires d'orges de brasserie (*Hordeum distichum* L.) cultivées au Maroc. **[On variations observed in elementary species of malting barleys (*H. distichum* L.) cultivated in Morocco].**
 Sélectionneur 1935: 4 (1): 26-39.

Continued observations made at Rabat on grains (about 30,000 per year) from pure lines and varieties of barley imported from Europe shewed that variation affecting mainly the number of teeth along the latero-dorsal ridge of the grain and the type of pubescence of the rachilla, was gradually occurring in all the elementary species. Some of the changes affecting the hairs are classed as non-hereditary, others as partly so and others as hereditary—though admittedly no definite conclusion can be drawn except as to the actual occurrence of variation. The pure lines observed were, it is suggested, in reality the products of artificial or natural hybridization between "jordanons" or elementary species that occurred long ago. The sudden change of environment and the new and severe climate probably led to the disintegration of these hybrids with consequent segregation.

895. IMAI, Y. 633.16:575.242
Non-viable leek-like mutant seedlings of barley.
 Jap. J. Genet. 1935: 11: 282-83.

Seedlings with thick narrow leaves and poor root development, somewhat resembling leek seedlings, occurred to the extent of about a quarter in two lines of an otherwise normal barley variety. They died about two months after germination. About one third of their normal

sister plants bred true, while two thirds segregated again into 3 normal : 1 leek-like, shewing that a single factor was concerned.

The non-viability of the mutant types appeared to be connected with their poor root development for they had ample chlorophyll for photosynthesis.

896. MICHELS, C. A. 633.16:581.46:575.11
A study of the appearance of awn characters in a cross between Meloy and Faust barley.
 Amer. Nat. 1936 : 70 : 13-18.

The two varieties are both hooded barleys, Meloy being apparently a field hybrid between Coast, a rough-awned variety and Nepal, a hooded variety, while Faust is a hooded selection from Himalaya.

The F_1 plants were all hooded and in the F_2 segregation occurred in three classes with respect to awns—smooth-awned, rough-awned and hooded. The ratio of rough-awned to smooth-awned gave a very good fit to 3 : 1, the dominant factor *R* for rough awns probably coming from Meloy. The segregation for presence of awns was approximately 3 hooded : 1 awned and though the fit was very bad, the observed figures being 862 hooded to 347 awned, this is attributed to the small F_2 progeny. It is considered that duplicate factors are concerned, Faust being *AAbb* and Meloy *aaBB*, awned forms being *aabb*, though it is not explained how a 3 : 1 ratio is obtained on this hypothesis.

897. MEL'NIKOV, A. N. 633.16:581.48
(On the husked cultivated barley).
 Bull. Appl. Bot. Leningrad 1935 : Ser. A (14) : 101-06.

An anatomical examination of a large number of barley varieties has shewn that no clear line of demarcation is to be found between hulled and naked barleys, there being an unbroken series of intermediate forms between the very thick husked barleys characteristic of Abyssinia and the true "naked" barleys. Varieties even occur in which the inner palea is attached to the grain, while the flowering palea remains unattached, such "half naked" forms being of frequent occurrence also in crosses between hulled and naked forms. The real difference between the forms is in the amount of mechanical tissue in the flowering palea, the naked forms having the least and the thick husked forms the most, with all possible intermediates. The naked forms tend also to be more tender in the rest of the plant and to have weak straw with a tendency to lodge. There can be no question of a single gene determining the difference between naked and husked forms and the genetics of the character is to be the subject of further study.

898. TAPKE, V. F. 633.16-2.451.2-1.521.6:578.081
An effective and easily applied method of inoculating seed barley with covered smut.
 Phytopathology 1935 : 25 : 1038-39.

A method of inoculating barley seed with *Ustilago hordei* (Pers.) K. and S. is described which involves soaking the seeds in a suspension of spores and has given up to 70 per cent of smutted heads.

899. 633.16:663.421:575:578.08
 DICKSON, J. G., SHANDS, H. L., DICKSON, A. D. and BURKHART, B. A.
Barley and malt studies : I. Developing new varieties of barley for malting and their properties.
 Cereal Chem. 1935 : 12 : 596-609.

In this tentative outline methods of procedure in the determination and the improvement of quality in barley are considered. A survey of the varieties available in the United States, comparative varietal studies and a description of the recognized ways of selecting and breeding new varieties of malting barley are also included.

MILLETS AND SORGHUMS 633.17

900.

LI, H. W., MENG, C. J. and LIU, T. N.

633.171:581.162.3

633.171:576.312.35

Problems in the breeding of millet [*Setaria italica* (L.) Beauv.].

J. Amer. Soc. Agron. 1935 : 27 : 963-70.

The course of anthesis is described ; the periodicity previously reported by other workers (Cf. " Plant Breeding Abstracts," Vol. IV, Abst. 30) was confirmed and it was found that the number of blooms opening was negatively correlated with temperature and positively with humidity.

Since the anthers do not shed until after they and the stigma have emerged a certain amount of cross pollination occurs, estimated at 5.60 ± 2.10 per cent in 1933 and at 7.63 in 1934 by different methods. Emasculation of single flowers by hand can be performed after the flowers have opened ; a method of bulk emasculation by hot water is also described.

Setaria italica and *S. viridis* were both found to have 18 somatic chromosomes, with 9 bivalents at meiosis.

901.

LI, H. W., MENG, C. J. and LIU, T. N.

633.171-1.421:575

Field results in a millet breeding experiment.

J. Amer. Soc. Agron. 1936 : 28 : 1-15.

In a uniformity trial with millet to determine the optimum size and shape of plot it was found that under the conditions of the experiment greatest efficiency was obtained with two-row plots 15 feet (1 foot = $\frac{1}{3}$ metre) long. Where the area of land available is not a limiting factor two-row plots 30 feet long would appear to be best.

Evidence was obtained of the effect of competition between varieties in variety trials, yield giving a significant negative and date of heading a significant positive correlation with competition.

Though the yield appeared to vary directly with planting distance the effect was not statistically significant. It is suggested that in varietal trials plants should be spaced 2 or 3 inches apart, which not only gives the maximum yield but also nullifies the effect of missing plants.

In studying the effect of the internal yield components on yield simple and multiple correlation coefficients were used. Using simple correlation stooling was not significantly correlated with yield while height of plant, date of heading, length of head and weight per 10,000 kernels all gave significant positive correlations. Using the partial correlation coefficients, however, it was found that stooling was associated with yield while height of plant on the other hand was not. The other factors shewed the same relation as before except earliness, the partial correlation coefficient of which was less significant.

902.

SHEN, S. T. and ONG, T. T.

633.171-1.557:575.14

(Effect of selfing upon yield of millet).

Proc. 1st Pl. Breed. Conf. China (1934) 1935 : 24-25.

Twelve strains of millet were employed to study the effect of selfing upon yield. A number of the plants were artificially selfed, while the others were left to natural pollination. According to three year's results, the two methods compared gave no difference in yield.

P.C.M.

903.

CHEN, S. C. and Tsu, T. S.

633.171-2.451.2-1.521.6:578.081

(Preliminary report on studies of sorghum varieties resistant to head smut, *Sorosporium reilianum*).

Proc. 1st Pl. Breed. Conf. China (1934) 1935 : 60-62.

Comparative tests shewed that seed moistened before inoculation always gave a higher percentage of infection than unmoistened seed. Of the 42 sorghum varieties used, 13 were introduced from the United States, the rest being native varieties. Regarding the response after inoculation, there was a marked variation among the different varieties, indicating the possibility of breeding for disease resistance in this particular crop. For example, in the case of inoculating wet seeds, Kaifeng S16 and Nansuchow 1A7-9C-2A-4D shewed 4.6 per cent and 4.3 per cent of infection respectively, while Shansi 121 shewed no infection at all. Observations were also made on plots

of varietal trials where the varieties were exposed to natural inoculation. Among the 90 varieties observed, 35 of which were from Kansas, U.S.A., Hopei A71 shewed 9.3 per cent of infection, while all varieties from Kansas, with five exceptions, escaped infection. Attention was called to the fact that, like Nanking 547, varieties may shew no sign of head smut under natural conditions but may become susceptible to the disease after being artificially inoculated.

P.C.M.

904. Hsu, T. S. 633.174:581.162.32
(Study of natural crossing in kaoliang).

Bull. Coll. Agric. For. Nanking 1934 : No. 25 (N.S.) : Pp. 15.

An average of about 4 per cent of natural crossing was found to occur between the two strains used, while under the conditions of the experiment 400 feet was found to be the least distance at which cross-pollination could safely be considered to be absent.

RICE 633.18

905. 633.18:575(51)
(On the line selection of Foochow rice variety and selected new lines.)
 Bull. Dep. Rur. Elect. Foochow 1934 : 3 : 1-9.

The results obtained in tests of selected strains of rice are given as well as the botanical characteristics of three strains, Pe Tsao, Ta Tsao and Chin Tsao. Pe Tsao is an early strain.

906. 633.18:575(51.2)
 KAMO, I. 633.18:581.143.26.035.1
(The characteristics of Japanese rice varieties in Formosa and outline of the breeding work in this department.)

Rep. Dep. Agric. Govt. Res. Inst. Formosa 1935 : No. 67 : Pp. 140.

Chapters I and II of this bulletin deal with the characteristics of Japanese lowland and highland varieties of rice.

Chapter III outlines the early history of rice cultivation in Japan and Formosa in particular and of the rapid progress of the Japanese varieties and the spread of Horai-mai (Elysian rice), the most popular of the early Japanese varieties.

From 1922 to 1930 the Formosan Department of Agriculture concentrated on the breeding of good varieties and large numbers of crosses were made in order that all varieties should be tested. From 1931 up to the present day selection and breeding has been actively carried on and combined with the study of photoperiodism. Statistics are given of the best varieties produced by Dr. Iso, the originator of the Horai-mai rice and data on the geographical and chronological distribution of the original varieties are given.

Chapter V deals with the future trend of rice breeding in Formosa which should aim at the selection and breeding of higher yielding and better quality types than those of Japan.

The main factors in determining high yield are considered and the frequency of these various characteristics among the different varieties is shewn in detail in tabular form.

In future improvement work, it is suggested that in selection a study should be made of photoperiodism in the various types of rice, then the external and internal qualities should be investigated and ultimately groups of good varieties should be built up.

907. NAKAYAMA, K. : 633.18:575.1-181:581.48
Study on the inheritance of the size and shape of rice grains.

Sci. Rep. Tôhoku Univ. 1935 : 10 : Ser. 4 (Biol.) : 569-80.

The Japanese version of this paper has already been reviewed (Cf. " Plant Breeding Abstracts," Vol. II, Abst. 635).

908. IMAI, Y. 633.18:575.11:581.331.23
The remarkable low ratios of recessive segregates in *Oryza sativa*.
 Bot. Mag. Tokyo 1935 : 49 : 701-08.

An average of 5.6 per cent of recessive dwarf forms occurred in the progeny of plants heterozygous for the character. It is believed that the character is a simple recessive and the deviation from the ratio 3 normal : 1 dwarf is ascribed to gametophytic competition, the chances against a dwarf gamete contributing to fertilization being calculated as 11.5 : 1. On this basis the observed ratio of heterozygotes to homozygotes among the normal plants gives a good fit to the calculated ratio.

Similar behaviour was noted in the case of the slender mutant, a somewhat etiolated, non-viable form. In this case the proportion of recessives in the progeny of heterozygous normals was about 3 per cent in 1932 and 1933 while in 1934 it increased to nearly 15 per cent.

Certation is again the hypothesis advanced to explain the deficiency, while reduction of the deficiency in the last year is ascribed to a decrease in the disharmony between the plasm and the gene in slender gametes, owing to adaptation of the plasm.

909. NAKAYAMA, K. 633.18:575.11.061.6
On the inheritance of the anthocyanin formation in various organs of the rice plant.
 Sci. Rep. Tôhoku Univ. 1935 : 10 : Ser. 4 (Biol.) : 581-88.

The English version of a paper which has previously been published in Japanese (Cf. "Plant Breeding Abstracts," Vol. II, Abst. 636).

910. JONES, J. W., ADAIR, C. R., 633.18:575.11"793"
 BEACHELL, H. M. and DAVIS, L. L. 633.18:581.48:575.11-181
Inheritance of earliness and length of kernel in rice.
 J. Amer. Soc. Agron. 1935 : 27 : 910-21.

In studying the inheritance of earliness the crosses Bozu (early) x Edith (late), Bozu x Blue Rose (medium late), Colusa (early) x Edith and Colusa x Blue Rose were used, while in studying the inheritance of grain length the crosses used were Butte (short) x Edith (long), Caloro (short) x Honduras (long), Colusa (short) x Blue Rose (medium) and Edith (long) x Blue Rose. The F_2 progenies were grown in three different localities and in some cases F_3 s were also grown.

The inheritance of earliness appeared to be different according to the varieties used. In the crosses Bozu x Edith and Bozu x Blue Rose several genetic factors were concerned, the earliness of Bozu being partially dominant. In the cross Colusa x Edith arbitrary classification into early and late on the basis of the range of the Colusa parent gave a ratio of 9 late to 7 early indicating that inheritance of earliness is mainly determined in this cross by complementary factors, though the range of forms and the occurrence of transgressive segregation shewed that modifying factors also are involved. By a similar method of classification evidence was obtained suggesting that in Colusa x Blue Rose one main genetic factor was concerned, giving 3 late to 1 early, with modifying factors as in the previous cross. The results in F_3 confirmed these conclusions in each case.

The inheritance of grain length in all crosses was on a multiple factor basis. From the reciprocal crosses between Lady Wright (long) and Caloro (not made during the present investigation) pure breeding lines have been produced with respective grain lengths ranging from less than the shorter to as long as the longer parent.

The F_2 segregations were essentially similar at the three different stations with one exception viz. the number of late plants obtained at Biggs, Calif. in the F_2 of the cross Colusa x Blue Rose was greater than that required for the 3 : 1 ratio.

911. MULIMBAYAN, M. B. 633.18:581.162.3:578.08
A comparative study of two methods of emasculating rice flowers for artificial hybridization work.
 Philipp. Agric. 1935 : 24 : 574-93.

Following a review of the relevant literature, the results of comparative experiments are examined

to find out whether the clip or the split method of emasculation of rice is more efficient and which is more convenient for long and short grained varieties respectively. In the clip method the tip of the palea is cut and the anthers removed while in the split method the glumes are forced open and the anthers gently extracted.

Judged by the average percentage of treated grains that reached maturity, the clip method not only was more successful for both long and short grained varieties than the split method but also required less time. On the other hand a higher percentage of germination is more likely to be obtained by the split method.

Germination was generally higher in the close-pollinated plants than in the cross-pollinated ones. Van der Meulen's suction method of emasculation (Cf. "Plant Breeding Abstracts," Vol. IV, Abst. 169) was also tested on two panicles.

LEGUMINOUS FORAGE PLANTS 633.3

912. SAVCHENKO, P. F. 633.367:576.312.34
 (Karyology of some species of the genus *Lupinus*). 633.367:576.312.35
 Bull. Appl. Bot. Leningrad 1935 : Ser. 2 (8) : 105-11.

Investigations were made on the chromosome number, size and form in various lupin species. *Lupinus angustifolius* L. had 40 somatic chromosomes, small and rod-shaped ; *L. pilosus* also had 40, some very small and the rest about twice the size ; in *L. albus* $2n = 48$, the chromosomes being similar to *L. angustifolius* in size but more varied in form ; in *L. luteus* $2n = 52$, one pair being V-shaped and the remainder very uniform and rod-shaped ; in *L. subcarneus* $2n = 48$, all very uniform ; *L. varius* $2n = 48$, closely resembling the latter ; *L. mutabilis* $2n = 48$, somewhat larger than the latter, one pair longer than the rest, the others very uniform ; *L. polyphyllus* $2n = 48$, varied in form ; *L. arboreus* $2n = 48$, very uniform ; *L. pubescens* $2n = 48$, with great variation in length, with 6 V-shaped chromosomes ; *L. elegans* $2n = 48$, 6 V-shaped chromosomes and one pair of much longer chromosomes than the rest.

The chromosome numbers observed in some of the species differed from those reported by certain earlier investigators, whose results are called in question. The conclusion is reached that two basic chromosome numbers, 8 and 10, exist in the genus. The numbers 40 and 52 occur only in the old world species, all the new world species have 48 chromosomes. The absence of V-shaped chromosomes in *L. angustifolius* supports Zhukovsky's assumption that this is a species of recent origin, and the prevalence of the rod-shaped chromosomes even points to the comparatively recent origin of the genus as a whole, a conclusion also in agreement with the geographical data of Zhukovsky.

913. LEVIN, JA. 633.367:581.192.6:575
 [The problem of the sweet (alkaloid-free) lupin].
 Sotsialističeskaja Rekonstruktsija Sel'skogo Khozjaistva (Socialist Reconstruction of Agriculture) 1935 : No. 10 (4) : 150-57.

The history of the production of alkaloid-free lupins by selection—Prjanišnikov, Sengbusch—is briefly described and successful experiments on their use as a concentrated stock feed are referred to. In view of the secrecy which envelops the sweet lupins in Germany, all the more interest is attached to their successful production also by the Soviet workers. They are being rapidly multiplied and will soon be in extensive cultivation and it is urged that more attention should be given to this valuable new achievement.

914. SVIRSKII, JA. N. 633.367:581.192.6:575
 (Alkaloid-free perennial lupins).
 Selekttsija i Semenovodstvo (Breeding and Seed Growing) 1935 : 2/10 : p. 48.

The various characters and advantages of the perennial lupin, *Lupinus polyphyllus*, are described. By selection on the same lines as those adopted for the other species (Cf. "Plant Breeding Abstracts," Vol. III, Abst. 437) alkaloid-free forms have been produced in the perennial lupin, in *L. elegans* and in certain other species.

915. GREB, R. J. 633.367:581.43:575.11
Two genetically different rootlet types in the lupine.
 J. Hered. 1935 : 26 : 503-04.

In the determination of the phytotoxic index of blood serum the effect on the rate of growth of the roots of *Lupinus albus* seedlings is measured. The author found two types of seedlings produced from the seed material he used, one with short hairy roots, breeding true in the next generation and the other with roots growing more quickly and producing no root hairs until the root was about 30 mm. long ; plants of the latter type segregated into hairy and non-hairy in the ratio 1 : 2.

This evidence of genetical heterogeneity in seed material shews the need for care in selecting material for experiments based on plant or animal reactions.

916. 633.367:581.9:576.16
 FISCHER, A. and SENGBUSCH, R. v. 633.367:581.5
 Die Anbauggebiete der Lupine auf der Erde, insbesondere in Europa. (**The areas of cultivation of the lupin in the world, and especially in Europe.**)
 Züchter 1935 : 7 : 284-93, 321-24.

A phytogeographical study shewing that at least three gene centres of distribution, North America, South America and the Mediterranean must be assumed for the genus *Lupinus*. Historical and recent data on lupin cultivation throughout the world and especially in European countries are given with reference also to the influence of differences in soil and climate (Cf. also "Plant Breeding Abstracts" Vol. VI, Absts. 569, 570 and 571).

ROOTS AND TUBERS 633.4

917. RASMUSSEN, J. 633.4:575(48.5)
 Rotfruktsförädlngen vid Sveriges Utsädesförening. (**The breeding of root crops by the Swedish Seed Union.**)
 Lantbruksveckans Handlingar 1934 : 220-31.

A brief review of the history, methods and aims of the Swedish Seed Union in the breeding of root crops.

918. DECOUX, L. and ROLAND, G. 633.41:576.16
 Betteraves sauvages. (**Wild beets.**)
 Publ. Inst. belge Amélior. Better. 1935 : 3 : 313-22.

A comparison of wild beets from various parts of Europe shewed that those from Denmark and Belgium most nearly resembled the sugar beet in high sugar content, low ash content, resistance to bolting in the first year and the denseness of the vascular tissue. It is suggested that such types might be crossed with the sugar beet with advantage to the latter.

919. KAKHIDZE, N. 633.41:576.312.34
 (**Karyological analysis of *Beta vulgaris* L.**)
 Bull. Appl. Bot. Leningrad 1935 : Ser. 2 (8) : 99-104.

When polyploid and heteroploid forms are present, as they are in *Beta* (see "Plant Breeding Abstracts" Vol. III, Abst. 466), it becomes possible to trace the genetic characters down to individual chromosomes by the study of trisomics, but for this a knowledge of the morphological peculiarities of the individual chromosomes is necessary. Examinations of this sort were undertaken on a wild Algerian beet, *B. vulgaris perennis* L. (*B. maritima* L.) and an Egyptian, cultivated table beet, Levitsky's chromic-formol mixture being used, in varying proportions. The various chromosome types are described and illustrated for both beets. The idiograms of each are very similar, the only difference being that secondary constrictions were observed in only two chromosome pairs in the wild beet and in three in the Egyptian variety. The different chromosome types were detected both in somatic divisions and at meiosis.

920.

SIROTINA, M. I.

633.41:576.312.35

633.41:576.356.5:576.16

(Karyology of the genus *Beta*).

Naučnye Zapiski Sakharnoi Promyshlennosti (Sci. Trans. Sug. Ind.) 1934 :
Nos. 4, 6 : 11 : Nos. XLII, XLIV : 58-64.

Examinations were made of the chromosomes of fifteen families of wild beet from different localities. The number 18 was observed in root tips of most species, namely : *B. vulgaris*, *B. maritima*, *B. vulgaris* var. *perennis*, *B. patula*, *B. macrorrhiza* and *B. lomatogona*. One tetraploid root was observed in *B. macrorrhiza*, having $2n = 36$ whilst all other root tips of the same plant had 18. Similar isolated tetraploid rootlets had been observed previously in sugar beet. In *B. patellaris* meiotic counts gave $n = 9$.

As regards *B. trigyna* the Transcaucasian forms had $2n = 36$ whilst of the Crimean forms some had 36 and some 54, and the forms occurring still further west, in Hungary and neighbouring countries, being all hexaploid ($2n = 54$). The polyploidy in this species is regarded as a side branch of the evolutionary stream in the genus, the main course of evolution having proceeded without increase in the chromosome number. It confirms the systematic independence of the species. The occurrence of natural polyploidy appears to be associated with the different geographical situations occupied by the species and the tetraploid has apparently arisen through the influence of severe climatic conditions on an initial form with $2n = 18$ supposed to have existed somewhere in Asia Minor. There seems to be no clear morphological difference between the tetraploid and hexaploid forms.

921.

ABEGG, F. A. and OWEN, F. V.

633.41:581.143.26:575.116

A genetic factor for the annual habit in beets (*Beta vulgaris*, L.) and linkage relationship.

Amer. Nat. 1936 : 70 : p. 36. (Abst.)

The factor *B* for annual habit and *R*, a red crown colour factor were found to be linked, with about 16 per cent crossing-over between them. The same main factor *B* seemed to be responsible for a tendency to bolting under special conditions in a non-annual type studied, as the same linkage with *R* was found. It appears that there is thus one major bolting factor but its expression is dependent on other modifiers and environmental conditions.

922.

DECOUX, L. and ROLAND, G.

633.41:581.143.32

Betteraves anormales. (Abnormal beets).

Publ. Inst. belge Amélior. Better. 1935 : 3 : 207-25.

Strains of beets shewing the abnormalities already described by Munerati (Cf. "Plant Breeding Abstracts," Vol. IV, Abst. 1008) were investigated and all shewed a reduction in sugar content.

923.

OWEN, F. V.

633.41:581.162.5:575.11

Self-fertility and self-sterility in beets.

Amer. Nat. 1936 : 70 : 58-59. (Abst.)

The theory of an allelomorphic series of sterility factors does not appear to be sufficient to explain the phenomena of self and cross-sterility in beets, though the results are clear-cut and evidently governed by some definite rules of inheritance.

The results of the work on self-fertility are easily explained on the basis of the factor *Sf* similar to that described in *Nicotiana* (Cf. "Plant Breeding Abstracts" Vol. II, Abst. 385).

Various heritable degrees of pseudo-fertility have also been noted. It seems to be most pronounced after the plants have been forced to flower several times.

924.

KOZINETZ, T. E.

633.41-1.524.4:581.4

(On the anatomy of the Transcaucasia wild beet species).

Naučnye Zapiski Sakharnoi Promyshlennosti (Sci. Trans. Sug. Ind.) 1934 :
Nos. 4, 6 : 11 : Nos. XLII, XLIV : 31-44.

An exhaustive study has been made of the anatomy of the wild beet species *B. lomatogona*, *B. trigyna* and *B. macrorrhiza* from Transcaucasia (Cf. Abst. 965) from the point of view of their

value as breeding material, indications being given of the desirable and of the undesirable features. In addition to the characters referred to in the earlier article special mention is made of the occurrence of starch in the roots of both *B. trigyna* and *B. macrorhiza* and of a sugar content of up to 12 per cent in the latter species, combined with large roots of up to 15 cm. in diameter and entirely free from mechanical tissue, of a type therefore resembling the cultivated beet and lending particular interest to this species as a parent.

925. ABEGG, F. A. and OWEN, F. V. 633.41-2.8-1.521.6:575.116
A genetic factor for curly-top disease resistance in beets (*Beta vulgaris*, L.) and linkage relationships.
 Amer. Nat. 1936: 70: p. 36. (Abst.)

Resistance to the curly-top disease is conditioned by a partially dominant factor *C*, which is linked to the red crown colour factor *R* with 20-30 per cent crossing-over. The economic importance of the factor *C* is shewn by the fact that it has been found associated with resistant selections from the variety U.S. No. 1.

926. TIKHONOV, M. S. 633.416 Hybrid No. 463
 633.416:575.12:633.63
(A new promising variety of fodder beet "Hybrid No. 463").
 Selekttsija i Semenovodstvo (Breeding and Seed Growing) 1935: 2/10: 46-48.

The harvesting of the average fodder beets is simpler than the sugar beet owing to their shallow position in the soil. The yield of dry matter per hectare is higher in the sugar beet and experiments were made to produce a beet of the same dry content but the shallow position of the root by crossing beets of the two types. The hybrid No. 463 issuing from this cross gave a percentage dry matter content of 18.1 per cent as compared with 13.7 per cent for the semi-sugar and 23.1 per cent for the pure sugar beets whilst its yield of dry matter per hectare amounted to 61.8 centners, which was greater than either the semi-sugar (54.8) or the pure sugar beet (56.8). The majority of the roots of the new hybrid could be removed from the ground by pulling, without the necessity of digging. The roots are long, oval in form, and still segregate for colour into 87.3 per cent yellow: 12.9 per cent white. Uniformity of colour and shape, combined with increased yield without loss of dry content will be the object of further selection.

927. EMME, E. K. and VESELOVSKAJA, M. N. 633.491:575.127.2
(On the estimation of the value of forms of the new species of the potato *S. andigenum* Juz. et Buk. as parents of new hybrid varieties).
 Bull. Appl. Bot. Leningrad 1935: Ser. A (14): 5-14.

Cyclic crosses were made between numerous forms of *S. andigenum* Juz. et Buk. and various cultivated forms of *S. tuberosum* to ascertain the economic value of the forms produced; the following features were used as criteria for the hybrid plants: productivity (weight per cluster), number of tubers per cluster, uniformity of cluster, starch content and the date of beginning of ripening. The seedlings were selected by inspection of the general appearance of the cluster. The productivity (weight of tubers per cluster) of the varietal hybrids was not particularly high but in certain combinations with *S. andigenum* satisfactory yields were obtained, the best crosses being those containing var. *hederiforme* Buk., f. *tocanum* Buk., f. *Usme* Buk., f. *tolucanum* or var. *quechuanum* (Taccla) Buk. et Lech.; while in hybrid families comprising f. *llutuc-runtun* Buk. et Lech. or f. *Chiar-imilla* Buk. et Lech. the productivity was very low. Since good yields were produced only from certain combinations the differences observed are regarded as genetic in origin, though it is recognized that inhibiting effects due to certain short-day forms on the tuber-forming capacity of the genotypes of the standard types obtained from *S. tuberosum* may also affect the results. It was also noticed that combinations involving good tuber forming types e.g. var. *hederiforme* Buk., var. *colombianum*, f. *Usme*, shewed a high percentage of F_1 seedlings with a high number of tubers per cluster. From the results with interspecific crosses the writers hold that yield is a genetic character but highly complex in nature. The number of tubers produced by the intraspecific hybrids was much lower than the numbers

obtained from interspecific crosses, which frequently produced 20–30 tubers per cluster, often more than 30 and in some cases more than 40. Long stalks and the high number of tubers in the cluster characteristic of *S. andigenum* were apparently dominant though incompletely so.

In the forms of *S. tuberosum* used in the interspecific crosses uniformity of the cluster was good, whilst in *S. andigenum* forms it was average or bad, probably owing to late maturity. In the interspecific hybrids uniformity was frequently bad, rarely average and very rarely good. This is attributed firstly to the difference in the photoperiodic reaction of the parents and absence of complete dominance of either type of reaction, and secondly to the dominance of the great length of the period of tuber formation in *S. andigenum*.

The starch content of the intraspecific hybrids was not very high (10–15.5 per cent) and in the interspecific crosses it did not exceed 12–15 per cent. The late maturation of *S. andigenum* proved dominant in the interspecific crosses.

In general resistance to *Phytophthora* (and partly also to virus) was considerably higher in the interspecific hybrids; and a number of seedlings that survived conditions of severe infection had also good culinary qualities.

Pollen sterility was clearly observed in the hybrids Epicure x *S. demissum* but was not exhibited in Epicure x *S. andigenum*.

928. KAWAKAMI, K. 633.491:578.082:581.331.2

(On the preservation of potato pollen.)

Agric. and Hort., Japan 1934 : 9 : 2012–16.

The optimum relative humidity for the storage of potato pollen was found to be 15–20 per cent. Under these conditions the pollen remained viable even after 14 days and proved capable of successful fertilization.

929. FUESS, W. 633.491:581.9

Die Urheimat der Kartoffel, ihre Einführung und Ausbreitung in Europa.

(The ancestral home of the potato, its introduction and spread in Europe).

Ernähr. Pfl. 1935 : 31 : 288–93.

The history of the potato is traced from its origins in South America to the various periods at which it was introduced via Spain and England to the Old World. Its subsequent spread to the different European countries and to Canada is also treated. Maps shewing the chronology of its progress and a bibliography are given.

930. SNELL, K. 633.491–1.521.1(43)

Restriction of the number of potato varieties in Germany.

Amer. Potato J. 1936 : 13 : 11–12.

A note on some of the few English and American varieties of potatoes introduced after 1870 into Germany and still in use in that country.

A policy of eliminating synonyms and unimportant types has been practised for some time and the official approval and certification of varieties are the work of the German Food Supply Board whose functions have already been described in "Plant Breeding Abstracts," Vol. VI, p. 209.

931. RASUMOV, V. 633.491–2.111–1.521.6

(Frost resistance of some potato species).

Bull. Appl. Bot. Leningrad 1935 : Ser. 3 (6) : 221–26.

Tests of frost resistance were made on a large number of the new South American potato species. *Solanum acaule* was the only really resistant species, remaining undamaged by temperatures down to -6°C . in the young stage (25 days old); even -7°C . only damaged 9 per cent of the leaves whilst all other species were killed outright. With the advance of the growing season the resistance diminished, -3°C . causing considerable damage to *S. acaule* at the end of the growing season.

Resistance greater than that of the cultivated potato was displayed by certain other species, namely *S. ahanhuiri*, *S. curtilobum*, *S. Juzepzucii*, *S. Pacus*, *S. Tacla* and *S. demissum*.

932. KOESLAG, J. D. 633.491-2.412.5-1.521.6
Het bepalen van den graad van aantasting bij aardappelschurft in verband met een onderzoek naar de vatbaarheid van verschillende aardappelrassen voor schurft. (**The determination of the degree of infection with potato scab in conjunction with an experiment on the susceptibility of various races of potatoes to scab**).

Landbouwk. Tijdschr., Wageningen 1935 : 47 : 621-35.

Some indications of varietal differences in susceptibility which might serve as a basis for selection of races for use in hybridization.

933. KÖCK, G. and GREISENEGGER, K. 633.491-2.412.5-1.521.6:575(43.6)
Tätigkeitsbericht des Kartoffel-Fachausschusses über das Jahr 1935. (**Report on the work of the Potato Committee for the year 1935**).
Neuheiten PflSch. 1935 : 28 : 164-67.

The work of the Potato Committee in Austria during 1935 included variety tests and the breeding of new strains for improvement. Much emphasis was laid on the latter activity owing to its great importance for Austrian agriculture. Numerous crosses were made and tests and multiplications of a number of wart resistant strains evolved in the previous year are in progress.

FIBRES 633.5

934. PIŠČUGIN, I. N. 633.51:575(47)
(**New varieties of cotton for the Fergana valley**).
Bor'ba za Khlopok (Cotton Campaign) 1935 : No. 8-9 : 119-22.

Efforts are being made to replace all the old, impure varieties by promising new varieties produced by breeding, such as Kolkhoznik (Cf. "Plant Breeding Abstracts," Vol. V, Absts. 399-401) which exceeds Navrotskii by 15 per cent in yield, by 3-4 in ginning percentage and 3-4 mm. in lint length and has proved a success in all districts except those with the very worst soils; No. 5F, a selection from Acala -0464, outyielding Navrotskii by 20-25 per cent and exceeding it by 3-4 per cent in ginning percentage and 3-4 mm. in lint length and particularly successful on salty or marshy soils; Pima F., a local selection from Pima and one of the most successful Egyptian varieties; and finally No. 2017 "K.I.M.", an early, long-linted American variety suitable for the more northerly or mountainous tracts.

935. BROWN, H. B. 633.51:575(73)
(**Cotton varieties recognized as standard commercial varieties**).
J. Amer. Soc. Agron. 1936 : 28 : 69-79.

Descriptions are given of the origin and characters of 31 varieties of cotton recognized as standard commercial varieties by the American Society of Agronomy and the Agronomists of the Association of Southern Agricultural Workers.

Each variety represents a distinct type, is of considerable commercial importance in at least some part of the Cotton Belt of the U.S.A., was grown extensively in 1930 and is still being grown. New strains introduced since 1930 are eligible for registration as New Varieties of Merit.

936. DAVIE, J. H. 633.51:576.312.35:576.354.4:576.16
633.74:576.312.35:576.354.4
(**Chromosome studies in the Malvaceae and certain related families. II**).
Genetica 1935 : 17 : 487-98.

The following somatic chromosome numbers are reported: *Anoda Wrightii* 36, *Lavater cachemiriana* 44, *L. micans* 42, *L. triloba* 44, *Sida Napaea* 28, *Sidalcea parviflora* (= *neomexicana*) 26, *Theobroma cacao* 20.

Observations were made on meiosis in *L. cachemiriana* (n = 22) and in *T. cacao* (n = 10), the only peculiarities observed being varying degrees of secondary association of bivalents at metaphase I and the occurrence of non-disjunctive separation owing to lagging on the metaphase plate in *L. cachemiriana*.

The derivation of the different chromosome numbers from the basic number 7 (see "Plant Breeding Abstracts" Vol. V, Abst. 21) is discussed. The hypothesis that the New World cottons are amphidiploids resulting from a cross between a diploid Asiatic and a diploid New World species (see "Plant Breeding Abstracts" Vol. IV, Abst. 864) is criticized on the grounds that this would involve their having originated since the discovery of America.

937. SOYER, L. 633.51:581.162.32:578.08
 Technique de l'autofécondation et de l'hybridation des fleurs du cotonnier.
 (**Technique of selfing and crossing flowers of cotton**).
 Publ. Inst. Agron. Congo Belge 1935 : Sér. Tech. No. 3 : Pp. 19.

After a consideration of the main factors favouring natural crossing between varieties of cotton grown side by side, various methods of preventing hybridization and ensuring self-fertilization are described, namely, keeping the young flower buds shut by binding the tips with cotton, wool, rubber or by a clip, a metal spiral or by gumming, stitching or bagging, by isolation of plants or plot cultivation under cages.

For hybridization purposes the classical method of emasculation and pollination as well as Doak's technique (Cf. "Plant Breeding Abstracts," Vol. V, Abst. 409) is described.

938. BECKETT, R. E. 633.51:581.47:575
Intracapsulary bolls in Asiatic cotton.
 J. Agric. Res. 1935 : 51 : 839-45.

The occurrence of small supernumerary bolls in the bolls of a Russian strain of *Gossypium herbaceum* appears to be an hereditary character, though greatly influenced by the environment.

939. CHENG, K. S., SU, Y. T. and YOUNG, C. J. 633.51:581.48:677.27:519.24
(Studies of the sample technique in cotton experiments. I. Sampling from locks).
 Bull. Kwangsi Agric. Exp. Sta. China 1935 : No. 2 : Pp. 40.

For the study of lint and seed characters in cotton it is desirable to get representative samples without the material becoming too bulky. Such characters are found to vary greatly from seed to seed in a single lock, while other factors causing variation are the nature of the boll, of the plant, and of the environmental conditions. The present is an experimental study of the variation of the seeds within a lock, in order to see whether it is practicable to make an arbitrary selection of a single seed per lock to secure representativeness. The experiments extended over 1934 and 1935, and both Chinese and American cottons were sampled, features like lint length, lint percentage and seed index, being studied. Differences between seeds were shewn statistically to be both consistent and significant. It would be possible, therefore, to suggest that particular seeds be always chosen for sampling. The authors, however, recommend the method of random sampling, for its theoretical and practical advantages. J.W.

940. SIAO, F. 633.51-1.421
Uniformity trials with cotton.
 J. Amer. Soc. Agron. 1935 : 27 : 974-79.

The results of uniformity trials carried out in 1930, 1931 and 1932 are reported. With regard to size of plot, it was found that increase either in width or length reduced the error and there were indications that under the conditions of the experiment wide plots were more desirable than long, narrow plots. Greater efficiency, however, was to be obtained by increasing the number of replications than by increasing plot size. The number of replications of plots of a given size required to reduce the standard error to 5 per cent varied considerably with season and so no definite number could be recommended.

The standard error for ten replications in randomized blocks was less than that for eight replications in systematic arrangement with a check plot occurring every fifth plot. In comparing Latin squares with randomized blocks the variance was less in the former. The distribution of the differences between the assumed treatments was shewn by the chi-squared test to conform with mathematical expectation in each case.

941. SOKURAJA-VYSOTSKAJA, O. 633.51:677.21:578.081
(Measurement of the lint length of cotton under field conditions. An apparatus constructed by the Central Breeding Station, NIHI).
Bor'ba za Khlopok (Cotton Campaign) 1935 : No. 8-9 : 127-32.

A cheap and simple device costing 1-15 roubles is described whereby measurements of lint can be made with deviations of not more than 1 mm. from measurements with Balls' apparatus. By its aid measurements on 500 seeds can be made and entered in the field during an 8 hour day by an unskilled worker.

942. NAGHIBIN, JA. D. 633.51.00.14(47)
(The results of cotton variety tests, conducted in the cotton regions of Uzbek, Turkmen, Tadjik, Kirgiz, Kara-Kalpak and Kazak Republics for 1932 and 1933).

Bull. All-Union Sci. Res. Cott. Inst. (NIHI) Tashkent 1935 : No. 1 (15) : Pp. 166.

A collective work dealing with the variety tests carried out over large areas in which the new strains evolved by the breeding stations have been compared with the old varieties. Yield and lint quality were the characters to which the chief attention was paid and the figures for the different varieties in different regions in this respect are tabulated and the results described. Many of the new strains, especially the early maturing ones, are shewn to be promising and the superiority of the new variety Kolkhoznik (Cf. "Plant Breeding Abstracts," Vol. V, Abst. 399) and others is confirmed, Navrotskii serving as a standard all through. The best varieties were different for different regions and many of the new Egyptian cottons have proved capable of cultivation in the Central Asiatic Republics of the U.S.S.R.

943. ARTEMOV, P. K. and ARSIRII, A. T. 633.522(47)
(Varieties of hemp in the U.S.S.R. Results of variety tests 1928-1933).
Lenin Acad. Agric. Sci., Inst. Pl. Ind., Hemp Inst. 1935 : Pp. 119.

The campaign for the all-round improvement of hemp cultivation in the Soviet Union includes the question of improved varieties. Breeding was only begun in 1931 and so far no entirely suitable selected varieties, either of local or foreign production, are available. Trials have been made at various places of races from different parts of the U.S.S.R., Italy, Japan and other countries and these have shewn marked variations in yield, both of fibre and of straw and seeds. The results of six years' testing of a number of these geographical varieties are here presented, since geographical differences have been the main factors responsible for the differentiation of varieties up to the present. The different types are briefly described and their performance discussed in respect of yield of straw, yield and quality of fibre, yield of seeds and oil, etc. The variability of a number of important characters such as length and diameter of stem, length of inflorescence, date of maturity, proportion of male to female flowers, as well as yield of fibre and seed, at different geographical positions and under different conditions of growth, length of day etc. was also investigated. In respect of the proportion of male to female plants very little variation was found either geographically or according to varieties, the proportion being usually about 1 : 1. The other characters however all display considerable variation, shewing hemp to be a particularly labile organism. Varietal diversity was particularly marked in respect of yield and date of maturity. Southern varieties when grown in northern positions produced more straw and fibre than the local varieties ; the quality of the fibre was improved but a lower yield of seeds and oil was produced and maturity was delayed. Northern varieties grown further south were inferior in fibre yield and equal to or slightly below the local varieties in oil production. The varieties reacted very differently to *Orobancha ramosa*, the Italian and Caucasian varieties being relatively resistant and the Japanese particularly susceptible ; the Japanese variety on the other hand seemed to be less attacked by *Psylliodes atlennata*.

944. MEDWEDEWA, G. B. 633.522:576.354.4:581.056
The climatic influences upon the pollen development of the Italian hemp.

Genetica 1935 : 17 : 461-70.

- The climatic influences upon the pollen development of the Italian hemp.**

Z. indukt. Abstamm.-u. VererbLehre 1935 : 70 : 170-76.

The same variety of Italian hemp (*Cannabis sativa*) grown at Moscow and in Gagre, a subtropical district of Transcaucasia, shewed wide differences in the course of microsporogenesis. The Gagre material had normal meiosis and produced normal pollen grains. In the Moscow material on the other hand numerous and striking irregularities were noticed in meiosis, such as fusion of archesporial and early prophase nuclei, failure of pairing, irregular metaphases and anaphases in the first and second divisions, formation of micro-nuclei and restitution nuclei and so on, culminating in the production of very irregular pollen grains.

The differences are ascribed to climatic conditions.

945. CRESCINI, F. 633.522:581.162.31:578.08
Un tipo di isolatore per la canapa (*Cannabis sativa* L.). [A type of isolator for hemp (*C. sativa* L.).]

Arch. Bot., Forli 1934 : 10 : 383-86.

A new type of isolator for hemp is described, made partly of cloth and partly of cellophane and supported by a spiral of galvanized iron wire attached to a wooden stick.

946. SATÔ, D. 633.526.23:576.16:576.312.35:576.356.5
Analysis of the karyotypes in *Yucca*, *Agave* and the related genera with special reference to the phylogenetic significance.

Jap. J. Genet. 1935 : 11 : 272-78.

The author's cytological investigations, taken in conjunction with other workers' results shew that *Yucca*, *Hesperoaloe*, *Hesperoyucca*, *Cleistoyucca* and *Samuela* in the *Liliaceae* and *Agave*, *Fourcroya*, *Polianthes* and *Beschorneria* in the *Amaryllidaceae* have a similar basic karyotype consisting of 5 long and 25 short chromosomes, and it is suggested that this should be considered in drawing up a phylogenetic classification.

Agave americana was found to be tetraploid with $2n = 120$, (20 long and 100 short) while *A. Saisalana* (sic., ? *sisalana*) was pentaploid with $2n = 150$.

947. UCHIKAWA, I. 633.584.5:576.312.35
Karyological studies in Japanese bamboo. II. Further studies on chromosome numbers.

Jap. J. Genet. 1935 : 11 : 308-13.

The chromosome numbers of 8 genera including 13 species of Japanese bamboo are recorded from root tip studies.

From the present data from previous investigations it is evident that most species of the Japanese bamboo have $2n = 48$ and only a few have $2n = 54$ or $2n = 72$, the last mentioned number being found in *Bambusa* species alone. The Basic chromosome number is assumed to be 6.

Phyllostachys reticulata Koch. proved sterile, though the 24 normal bivalents were found in the pollen mother cells and the pollen grains and ovaries were normally developed. The sterility is attributed to self-incompatibility. (Cf. "Plant Breeding Abstracts," Vol. II, Abst. 678).

SUGAR PLANTS 633.6

948. CERESA, G. 633.61:575
Some genetical notes on sugar cane. (First Contribution).

Proc. 8th Annu. Conf. Asoc. Tecn. Azucareros Cuba 1934 : 17-28.

A brief review of the work already accomplished in sugar cane breeding with special reference to the systematics of the genus and a consideration of future possibilities.

949. ROSENFELD, A. H. 633.61:575(62)
Sugar cane breeding in Egypt. A progress report.
 Bull. Tech. Sci. Serv. Cairo 1935 : No. 161 : Pp. 21.

An account is given of the classification of species of *Saccharum* and achievements in breeding in other countries are mentioned.

In the sub-tropical climate of Egypt sugar cane does not produce fertile seed but by the courtesy of breeders in different parts of the world fluff from some 50 trial combinations has been obtained and the seedlings grown at Giza. The more promising canes are tested at Nag Hamâdi, the object being to find a cane to replace P.O.J. 105, the standard sugar cane of Egypt.

Though the work so far is largely preliminary, indications have been obtained as to the lines along which the best results are likely to be obtained.

950. POEY, F. 633.61:575(72.91)
New cane varieties in Cuba. (Progress report).
 Proc. 8th Annu. Conf. Asoc. Tecn. Azucareros Cuba 1934 : 7-16.

A number of new varieties grown under observation for three years of the Java x Barbados line (POJ 2725 ♀ x BN 10-12 and SC 12/4 ♂), which is considered the most promising, and others are described.

951. ARCENEAUX, G. 633.61:575"793"
 633.61-1.557
Studies of ripening of sugarcane in Louisiana and of effect of topping upon yields of cane and sugar per acre.
 Circ. U.S. Dep. Agric. 1935 : No. 368 : Pp. 32.

Under the conditions obtaining in Louisiana early maturity is a question of prime importance. Studies were made on the progress of ripening of certain varieties and on the effect of discarding different amounts of the top of the cane. It was found that C.P. 28/19 and P.O.J. 234 were consistently early maturing while Co. 281, Co. 290 and P.O.J. 213 and C.P. 807 were less suitable for early harvesting.

The quality of the juices of the latter varieties could, however, be improved by topping the canes after harvesting and in the case of Co. 290 it was found that the yield of sugar per acre when the canes were topped sufficiently to bring the sugar content up to 162 lbs. per ton of cane was much greater than that from P.O.J. 234 and even, in many instances, greater than that from C.P. 28/19.

952. 633.61:576.312:575.12
 633.61:575(92.2)
 Verslag van de cultuur afdeeling van het proefstation voor de Java-suiker-industrie te Pasoeroean over het jaar 1933. (**Report of the Crop Section of the Experiment Station for the Java Sugar Industry at Pasoeroean for the year 1933**).
 Soerabaia 1933 : 8-22.

Cytological studies have been made in Holland of numerous clones used in the cytological hybridization scheme and of 10 hybrids and 3 parent plants at Pasoeroean.

Crosses were carried out at Pasoeroean and Malang, 140,592 seedlings being obtained from 130 combinations and of these 2,700 (from 19 crosses) were planted in connexion with the cytological investigation.

953. 633.61:576.312:575.12
 633.61:575(92.2)
 Verslag van de cultuur afdeeling van het proefstation voor de Java-suiker-industrie te Pasoeroean over het jaar 1934. (**Report on the Crop Section of the Experiment Station for the Java Sugar Industry at Pasoeroean for the year 1934**).
 Soerabaia 1934 : 78-94.

The chromosome number of 146 clones were determined by Dr. Bremer in Holland, and of 141 clones in Pasoeroean. Dr. Bremer also cytologically examined three grasses closely related to *Saccharum*.

Out of a total of 86,924 seedlings obtained from 800 combinations 3,836 seedlings from 18 combinations were intended for practical crosses, whilst the rest, which were for the purpose of study, 3,214 seedlings from 23 combinations were planted out as part of the cytological investigation.

Selection work was carried out by the Station and also by individual estates, 912 new seedlings having been compared with one another and with various test varieties. No new varieties were described and none put forward for registration in the Royalty Association.

Though it has not been possible yet to begin the charting of the sugar areas the preliminary survey of the soil is going on according to plan.

954. JEPSON, W. F. and EVANS, H. 633.61-2.7-1.521.6:575
Un essai préliminaire sur la résistance des variétés de cannes à l'attaque du *Phytophthora*. (**A preliminary test of the resistance of cane varieties to attack by *Phytophthora*.**)
Rev. Agric. Maurice 1935 : No. 81 : 97-101.

Observations were made on seven varieties, including P.O.J. 2878 and Uba and a new seedling of the Sugar Cane Research Station, Mauritius, M.104/30, from a cross between P.O.J. 2878 and Uba. This hybrid proved more resistant than any other variety so far tried but has had to be discarded on other grounds. Various other seedlings from the same cross are now being tested.

955. CHARMOY, D. d'EMMERÉZ de 633.61-2.8-1.521.6:575(69.81)
La lutte contre la mosaïque de la canne à sucre à l'Île de La Réunion. Son origine—ses effets—ses conséquences. (**The campaign against sugar cane mosaic in the island of La Réunion. Its origin, effects and consequences.**)
Rev. Agric. Maurice 1935 : No. 83 : 158-63.

The disappointment that resulted from the failure of most of the canes introduced from Mauritius and other countries on account of their susceptibility to mosaic might, the author maintains, have been avoided if the local canes had been given more attention. The cane Richefonds No. 1 for example, later proved relatively resistant. It was only with the formation of the La Bretagne research station that a proper study of the varieties was made and the most resistant strains from among them selected. The planting material issuing from this station is gradually superseding the old varieties and the mosaic question is becoming less acute. The merits and characteristics of the best canes, including several Java varieties, two Coimbatore and the local Richefonds No. 1 are described. In addition to immunity to mosaic the latter variety also possesses immunity to smut, precocity and considerable drought resistance. Local hybrid seedlings are also being tested.

956. 633.63:575(4)
633.63-1.524
Dahlberg returns with seed from wild beets of Europe.
Through the Leaves 1934 : 22 : 183-85.

In the course of a tour in Europe the research manager of the Great Western Sugar Company, U.S.A. has collected seeds of wild species of *Beta* and the resulting strains are to be used in breeding work mainly to introduce resistance to leaf spot disease and possibly earlier maturity. Mention is also made of projects in Germany and Russia with the object of breeding sugar beets with increased chromosome numbers.

957. ZOSSIMOVITCH, V. P. 633.63:575(47)
(**Main results of work on the genetics and breeding of sugar beet in the U.S.S.R.**)
Bull. Appl. Bot. Leningrad 1935 : Ser. A (14) : 15-24.

A review is presented of a portion of the extensive work carried out in the Soviet Union on sugar beet. In the attempt to move beyond the narrow limits set by the work of the last few decades and to find new and improved breeding material and methods, an exhaustive study has been made by Savitsky of the individual variability in different groups of sugar beets in genetically

pure material (clones), in populations and in inbred lines. The variation of different characters was studied with the object of finding correlations if they exist. By the use of cyclic crossing and repeated back-crossing with the recessive or with the parental form, kept growing by vegetative means, a start has been made on the study of the inheritance of sugar content and a number of other characters. Sugar content seems to be determined by 4-5 main gene pairs together with a number of modifiers, and in view of its relative simplicity therefore it has been possible to combine high sugar content with a number of other characters. The back-cross populations with the recessive contain a number of interesting forms and it has been found that the allelomorphs for sugar are different in the different groups of beet, so that in the F_2 of crosses between sugar beet and mangold forms have segregated which exceed the parental sugar content by 2-3 per cent. A beginning has been made in making chromosome maps and finding detector genes for the different linkage groups. Root weight has proved a very complex character and by inbreeding it has been possible to remove a number of depressing or semi-lethal genes.

Races with varying chromosome numbers have been selected, including triploid, tetraploid, pentaploid and various heteroploid forms. A gene has been discovered which favours chromosome irregularities and anomalies of division, and large numbers of tetraploid roots have been induced by the callus method of Jørgensen.

The distribution of the wild beets has been investigated by Zossimovitch, revealing a considerable degree of physiological isolation in species with the same chromosome number and the same area and origin, suggesting the possibility of sterility barriers developing between different races even of a cross-fertilized species such as sugar beet. The wild beets have disclosed a great variety of characters useful in breeding (see Abst. 965), including a number of variants as regards root anatomy etc. The somatic chromosome number 18, as in sugar beet, has been found in most species with the exception of *B. trigyna*, where natural polyploidy occurs (see Abst. 965).

Detailed studies have been made on the process of fertilization, more particularly in connexion with the problem of self-sterility and fertility. It has been shewn that the beet is not protandrous but that the stigma becomes receptive 6 days before the opening of the flower and retains its receptivity for 10-11 days after flowering. By reducing the temperature and humidity pollen can be kept viable for 50 days. The cause of self-sterility is not protandry but the reduced rate of growth of foreign pollen tubes. Grinko has found that this self-sterility is due to a recessive gene and has isolated self-fertile lines containing the corresponding dominant. A technique has been worked out for self-pollination and also for artificial hybridization. Thus inbred lines have been produced at all the breeding stations, both for the isolation of self-fertile strains and for crossing to make use of heterosis. Some of the inbred lines of Grinko are resistant to mosaic and to *Cercospora*.

Physiological studies have been made on the factors governing yield. Among other things a negative correlation has been established between sugar content and the size of calcium oxalate crystals in the leaves, and intensity of respiration of the leaves is correlated with a low yield of organic matter. The assimilates are transferred from the leaves to the roots in autumn in the form of monosaccharides and sucrose is formed again in the roots. Grafts of the leaf of one form of beet on the root of another form have shewn that the nature of the sugar storing process is dictated by the genotypical characteristics of the root structure rather than by the characters of the leaf. The sugars brought in by any particular leaf are uniformly distributed about the root, not confined to any special vascular ring.

By the application of vernalization and photoperiodism Tolmačev has been able to detect the plants in any given population which have a tendency to bolting. The seeds are germinated at low temperatures and grown in the extreme north with its long day, where the bolters come into flower and can thus be eradicated. Vernalization is regarded as an increasing of the dispersion of the colloids composing the cytoplasm. A reduction in length of day leads to increased yield and sugar content. Vernalization has also been used for inducing simultaneous flowering in crossing forms with different time of maturity.

Physiological studies have also shewn that the high yielding types are distinguished by greater leaf development in the early stages while the high sugar types have a greater leaf development at the end of the growth period. The percentage of noxious nitrogen has been reduced by 60-70 per cent by selection and the quality of the sap has thus been proportionally increased.

Numerous lines of investigation have been pursued to find methods of reliably determining the degree of resistance to disease, drought, cold, salinity, etc. in the early stages of breeding. Artificial infections are made with *Botrytis cinerea*, *Phoma betae* and selection is carried out for freedom from root parasites and from damage by storing. Races with increased resistance to *Cercospora* and mosaic have also been obtained.

A study of the new varieties produced has shown that they are most successful in the district in which they are produced, or in districts with similar ecological conditions. Some varieties, however, are more adaptable and accommodate themselves to a wider range of conditions than others. There are now available many suitable strains of sugar beet produced by Soviet breeders. The absence of industrial competition makes it more profitable to grow the high yielding "E" types, which produce a greater yield of sugar per acre than the high sugar "Z" types, but "Z" varieties giving a total yield of sugar equal to the "E" varieties have been produced by certain stations for purposes of export, and in the U.S.A. and Canada the Soviet varieties have competed well with the western European sorts.

958. POPOV, A. V. 633.63:575:578.08
(Methods of sugar-beet breeding during the second year of life.)
 Naučnye Zapiski Sakharnoi Promyšlennosti (Sci. Trans. Sug. Ind.) 1934 :
 No. 2 : 11 : No. XL : 59-66.

An examination of the factorial composition of succeeding generations shows that, owing to the uncontrolled nature of the pollen there is always a large proportion of undesirable types in each generation, and that even with rigid selection of the maternal plants and attainment of homozygosity the proportion of undesirables will be 50 per cent in respect of any one character. A method is proposed for overcoming this difficulty, depending on the fact that beets that have flowered once can, by transplanting, be made to flower again and give seeds the following year. Observations are made on root characters in the first year and on plant characters and floral characters in the second year and the best plants of the desired type are marked. In the second year after they have flowered the marked plants are transplanted all together to a single bed somewhat apart. The seeds produced from these plants should give plants practically homozygous for the desired features.

The proposed method makes it possible to look for plant characters appearing in the second year of growth which are correlated with the root characters and can so be used in selection. For instance early maturity can be judged much more easily and accurately by the time of ripening of the seeds than by examinations of the roots and observations made at the Ramon Zonal Station indicate that there is a correlation of some sort between the time of maturity of the root and of the fruits. The author's observations indicate that a negative correlation also exists between earliness and the amount of root formed in the second year, the earliest strains forming no root at all and the so-called "stubborn" forms that do not flower in the second year forming roots of up to 1 kg. and more ; these characters can apparently also be correlated with earliness of the root in the first year, the late forms evidently being incapable of completing their root growth in the first year.

959. SAVITZKY, V. F. 633.63:575.116.1.061.6
(Linkage observed in *Beta vulgaris* L. between the colour of root and leaves and the weight of root and sugar percentage).
 Naučnye Zapiski Sakharnoi Promyšlennosti (Sci. Trans. Sug. Ind.) 1934 :
 No. 12 : 11 : No. L : 1-17.

In breeding sugar beets the practice has always been to discard all individuals with coloured roots. Yet very little is known as to which characters, if any, are linked with pigmentation, though in a species with a chromosome number as low as 9 the question of linkage may be expected to assume importance. The question comes still more to the fore when dealing with interracial crosses between sugar and other beets, where at least 75 per cent of the progeny are usually

pigmented. The question cannot be settled by examining existing races directly, for the white and coloured beets have been selected on entirely different lines, the one for sugar, the other for yield and other industrial qualities; so they have come to differ in a large number of other characters entirely independent of pigmentation. The author therefore made observations on hybrids from crosses of sugar beet with forage beet, table beet and mangold. The F_1 hybrids were all coloured, giving 25 per cent white plants in the F_2 or 50 per cent in black-crosses with the sugar beet. No coloured beets ever appeared in F_3 families from white F_2 plants.

The root weight and sugar content were measured in differently coloured beets of the same cross. In the cross of sugar x forage beet the white F_2 individuals had on the average a higher sugar content and lower root weight than the coloured forms from the same cross; individual plants of the red families had however a sugar content equal to the highest white roots and occasional white plants were as low as the lowest red. In short, the frequency distributions of the red and the white coincided, but the mode was nearer the lower sugar content end in the reds and nearer the higher end in the whites. The distribution of root weight was on similar lines.

Similar results were obtained in the hybrids of sugar beet with red Oberndorf table beet. However, in the third generation from back-crosses with the sugar beets certain plants displayed new combinations of characters, such as white plants with low sugar content or with large roots—namely the cross-over types to be expected if the characters are situated in the same chromosome. The yellow individuals from crosses with the forage beet were, just as the reds, characterized by lower sugar content and higher root weight and it is pointed out that yellow and red pigmentation belong to the same linkage group. The association of these characters with colour is hence regarded as a genetic linkage and the origin of the new combinations mentioned above is attributed to crossing-over. This was finally confirmed by crossing the cross-over type, i.e. low yielding races of table beet and mangold, with sugar beet, in which case the linkage was reversed, i.e. the white individuals were characterized both by higher sugar content and higher root weight than the coloured segregates. Similarly in crosses of high-sugar coloured races with white races, the coloured segregates had a sugar content equal to the white segregates.

Pigmentation in the root and leaves are genetically linked, with a crossing-over percentage of 20 per cent in back-crosses of the hybrids on to the recessive. In general, therefore, the same kind of correlation exists between the leaf colour and sugar content and root weight as between these characters and root colour.

The above results shew that it is not enough merely to establish a "correlation" as has so often been done in the past; such correlations must be studied both in genetically pure and uniform material and in the progeny of known hybrids. Only so can the real nature and causes of the correlations be discovered and the neglect of this method of approach has vitiated the results of a great number of investigators. For instance if a genetical correlation exists, its sign, whether positive or negative has no real meaning, since it is dictated only by the combination in which the given characters were present in the parents of the cross. With such characters it is not possible to undertake "indirect selection" without first having a knowledge of whether in the population in question the two characters are in the coupling or repulsion phases. There has been too great a tendency in the past to investigate characters in isolation, without due consideration of their relationship to other characters and to the plant as a whole. It is not enough to establish an association between two characters, but these associations must be considered in relation to the process of development of the plant and also to the evolution of the species, i.e. both from the physiological and genetical aspects.

The behaviour of the present crosses shews a clear genetical linkage between pigmentation and certain industrial characters. The fact that the sugar content of the coloured segregates is rarely quite the same as that of the original coloured parent however shews that sugar content is conditioned also by other genes located in other chromosomes. The same is true with regard to root weight. Nevertheless in tens of thousands of hybrids of all kinds examined by the author no fixed negative genetical correlation has been observed between sugar content and root weight. There is therefore no reason why it should not be possible to combine the genetical capacity for producing a large root (given favourable growth conditions) with the maximum capacity for developing sugar content. Both characters are exceedingly complex but the present results have clearly shown that the usual linkage between them can be broken, as also the linkage between

them and the pigmentation of the root, and the author concludes that the commonly observed repulsion between yield and sugar content is indeed a consequence mainly of the different directions in which the two types have been selected. The production of the desired cross-over types will necessitate the use of large populations of F_2 and F_3 plants, but by this means the author confidently believes that it should be possible.

960. SAVITZKY, V. F.

633.63:575.12:578.08

(On the repeated back-crosses in beet).

Naučnye Zapiski Sakharnoi Promyshlennosti (Sci. Trans. Sug. Ind.) 1934 :
No. 2 : 11 : No. XL : 1-17.

By calculating the proportions of different genotypes in succeeding generations of a number of different types of cross the author arrives at certain general conclusions regarding the applicability of the method of repeated back-crosses. In respect of any genes for which the back-cross parent is heterozygous there is no increase in the proportion of homozygotes in succeeding generations.

Since the initial heterozygosity of the back-cross parent remains unchanged, the proportions of homozygotes and heterozygotes remain the same from generation to generation. There is also no progressive increase in the proportion of individuals with the desired characters, the proportion merely approaches successively to that in the progeny of the back-cross parent.

Even if the homozygous recessives are discarded in each generation the proportion of homozygotes to heterozygotes still remains equal in successive generations but the proportion of dominants to recessives among the former will rise more rapidly ; this is also true when both parents are heterozygous.

When the back-cross parent is heterozygous in more than one character the same argument applies, with increasing numbers of back-crosses the composition of the progeny tends to approach that of an ordinary F_2 for the two characters concerned, i.e. corresponds more and more closely to the gametic composition of the gametes of the back-cross parent. The same holds for cases of heterozygosity in three and more factors.

The process of repeated back-crossing leads to increasing homozygosity therefore only in the characters for which the back-cross parent is homozygous. Any increase in homozygosity beyond the existing level can be attained only by brother-sister matings or by inbreeding.

The method of repeated back-crossing is applied mainly not for increasing homozygosity but for introducing one or two isolated characters into an otherwise desirable strain. This is shewn to be equally true for both self-fertilized and cross-fertilized plants, since many of the commonly cross-pollinated plants are homozygous in a great number of the useful agronomic features. An illustration is given from the author's work on crosses between sugar beet (with 15.2 per cent sugar) and the red forage beet (6 per cent sugar). The F_1 was intermediate with 10.5 per cent sugar and the number of plants in F_2 with a sugar content equal to either one or the other of the two parents was extremely low, not more than 1.5 to 2 per cent. By crossing the F_1 back to the sugar beet parent the percentage of segregates of the sugar beet type was raised to 13 per cent and there was this time an entire absence of forms with the lowest sugar content. The average sugar content of the populations was also raised, being almost 13 per cent. The sugar percentage in the third and succeeding generations of back-crosses with sugar beet became equal or almost equal to that of the original sugar beet.

Lines equal in sugar content to the sugar beet parent occurred in the F_3 from ordinary inbreeding of the hybrids, but their proportion was very much lower than in the second back-cross progeny. In many other characters however the hybrids retained the characteristics of the forage beet, the precise nature of the back-cross generations varying with the character of the lines used for back-crossing. Selection can therefore be performed for the desirable characters of the other parent, except that when selection is carried out for a recessive character inbred generations must be interpolated between the back-cross generations to enable the recessive forms to segregate. In order to attempt to combine high sugar percentage and high yield it is recommended that the hybrids should be back-crossed on to the high yielding parents, because yield is the character shewing the greatest variation and selection for sugar content is therefore the more successful. The back-cross parent is maintained vegetatively from year to year and selection for yield is carried out at the same time.

961. COLIN, H. and BOUGY, E. 633.63:575.12:633.416:581.192
 Sucre, cendres, azote et phosphore dans les betteraves fourragères et sucrières
 et dans leurs hybrides. (**Sugar, ash, nitrogen and phosphorus in fodder
 and sugar beets and in their hybrids**).
 C.R. Acad. Sci. Paris 1935 : 200 : 853-55.

Analyses of chemical composition of various fodder and sugar beet varieties and F_2 hybrids from Vauriac (fodder) x Vilmorin (sugar) cross illustrate that selection for sugar content results in the elimination of a larger part of the mineral and nitrogenous substances in the root.

962. SAVITZKY, V. F. 633.63:575.172.3:575.14
 633.63:575.11:581.45
 (On the pleiotropic influence of the gene "*re*" reducing the leaf-blades
 in *Beta vulgaris* L. in connexion with inbreeding in selection of the
 sugar-beet).
 Naučnye Zapiski Sakharnoi Promyšlennosti (Sci. Trans. Sug. Ind.) 1934 :
 Nos. 8, 10 : 11 : Nos. XLVI, XLVIII : 1-7.

A study of inbreeding was made with the object of studying the effect of the various detrimental recessive genes still present in the common races of sugar beet. One such gene was isolated which in the recessive condition causes the production of narrow lanceolate leaves with very much reduced lamina at the end of the growing season in place of the normal, broad laminae developing at the beginning of the growing season. The heterozygotes are indistinguishable from the normals but give monohybrid segregation in the F_2 . The homozygous plants, in addition to the reduction in leaf surface, have a much reduced root weight and a 20 per cent reduction in total yield. The sugar content was also reduced by about 10 per cent, from which it is argued that the reduction in yield is not a result merely of the decreased assimilating surface. The gene *re* evidently affects a number of different characters of the plant in a similar manner. The desirability of removing these detrimental genes from breeding stocks by inbreeding and suitable selection is emphasized. Merely selecting on the basis of performance gives no security that genetically undesirable individuals are not being selected and such security can only be attained by a knowledge of the genetical constitution of the selected lines in respect of genes such as the one here considered. Many genes exerting a deleterious effect upon yield are without any morphological manifestation and their presence can only be determined by genetical studies.

963. RALEIGH, S. M. 633.63:581.141:581.162.31.02
 Environmental factors affecting seed setting in sugar beets.
 J. Amer. Soc. Agron. 1936 : 28 : 35-51.

The effect of different kinds of isolators and of other factors on the setting of selfed seed by sugar beets at three different locations in Minnesota was investigated, using statistical methods to test the significance of the results.

It was found that cutting back the branches to leave 10 to 50 glomerules gave better results than clipping only the ends of the branches, while more seeds were obtained when the isolators were opened after pollination had taken place than if they were left till harvesting.

Kraft isolators gave better results than cellophane or parchment whether they were opened or unopened.

Tent isolators gave much less seed than branch isolators, and mother beets planted early were more satisfactory than those planted later.

In general high temperature and humidity were unfavourable to seed setting.

964. ZAIKOVSKAIA, N. E. 633.63:581.162.4
 (Comparative tests on autofertile varieties of sugar beet at the Glav-
 sakhar Selection Stations.)
 Naučnye Zapiski Sakharnoi Promyšlennosti (Sci. Trans. Sug. Ind.) 1934 :
 No. 12 : 11 : No. L : 18-32.

The literature on inbreeding in sugar beet is reviewed and described, terminating with the work of Kharečko-Savitskaja who shewed that self-sterility was caused by the slower growth of self

pollen in the style, often preventing it from reaching the ovary while still capable of fertilization, and by the frequent occurrence of inviable zygotes. Cytological examinations were made on 38 self-fertile lines that have been selected by various stations in the U.S.S.R. Periodic fixations were made of flowers exposed to free pollination; fertilization had already begun after 24 hours from flowering. The course of fertilization and development of the young embryo are described and illustrated. Differences were observed between different flowers in the rapidity with which the processes took place, suggesting the possible existence of different fertility groups. Similar observations were made on self-pollinated flowers. Here out of 796 ovules examined only 489 were fertilized (i.e. 61.4 per cent as compared with 95.2 per cent in the open-pollinated flowers). The figure varied however for different races, 4 races from the Ivanov station giving 100 per cent fertilization. In three of these races the rapidity of the embryo formation was equal to that in free-pollinated flowers but in the rest it was slower. Thus in most cases under free pollination the suspensor forms during the first two days after flowering. This was also the case in the 100 per cent self-fertile forms whilst in the other forms it was much slower on self-pollination and in some races it had not begun to form after three days and more. The final degree of success was in direct proportion to the rapidity of this development which is largely governed by the rapidity of development of the pollen tubes. No development occurred in flowers bagged after emasculation, and no case of parthenocarp was observed.

965. BARTELS, H. 633.63:581.192:578.081
 In einer Minute Bestimmung des Zuckergehaltes von Rüben auf dem Feld.
 (Estimating the sugar content of beets in a minute in the field).
 Umschau 1935 : 39 : p. 679

A new form of simple portable refractometer specially designed for making rapid determinations on sugar beet is described. The chief advantage of the apparatus consists in the fact that readings of the sugar content are made directly from the scale. It has also been used for similar determinations on tomatoes and vines.

966. 633.63-1.524.4(47.9)
633.41:576.16:576.356.5
633.41:576.312.35
 ZOSSIMOVITCH, V. P.
 (Wild species of beet in Transcaucasia).
 Naučnye Zapiski Sakharnoi Promyšlennosti (Sci. Trans. Sug. Ind.) 1934 :
 Nos. 4, 6 : 11 : Nos. XLII, XLIV : 1-30.

An expedition was made in 1931 to Transcaucasia for the collection of wild beets, this being one of the centres of origin and distribution of a great number of plants and characterized by a remarkable abundance of varieties and local types.

Wild beets occur in a great number of countries bordering the Mediterranean. By the application of the modern views on the nature of a species it has been possible to introduce certain modifications into the existing classification of the species. These are divided into three main groups, the eastern group, consisting of *B. lomtogona*, *B. trigyna* and *B. macrorrhiza*, the central group consisting of the polymorphic species *B. vulgaris* with all its numerous subspecies, and the western group with *B. patellaris*, *B. procumbens* and *B. Webbiana*. The area of distribution of the subspecies *perennis* Hal of *B. vulgaris*, the form characteristic of Transcaucasia, was studied in detail. The climatic conditions of the district and the types of beet found wild and as weeds in the different regions are described. The wild beets of the Caspian steppe zones are of interest for their drought resistance and early maturity but on account of a number of undesirable features such as a tendency to bolting they cannot be used directly for selection but are of great value for hybridization, especially in view of the ease with which they cross with the cultivated beet. All are extremely halophytic. In spite of a great external uniformity there exists a great variety of distinct eco- and climatypes. Among the weed forms growing in the irrigated cotton and other fields a number of quite characteristic types have evolved. Here all variations from

extreme dwarf to giant forms appear, this wide variation having been made possible during the last few years by the alteration of the growth conditions by irrigation. The leaves of some of the weed beets are used by the inhabitants and it is thought that beet is a "young" crop the process of whose domestication is only in its early stages, thus providing another example of Vavilov's principle of origin of cultivated plants from weed forms.

Similar data are presented in respect of the eastern species, which form a compact group of closely related species, all occurring in the mountainous regions between 1,000 and 2,000 m., and growing as weeds in the vicinity of human habitations. The leaves of these species are also occasionally used as food. The descriptions start with *B. lomatosogona*, in which the species *B. nana* Boris. and *B. intermedia* Bge. are now included as subspecies. The chromosome number was determined as $2n = 18$, the same as in *B. vulgaris*, though the chromosomes themselves were different in the character of their morphology. The species is of interest on the score of its winter habit, cold and drought resistance, and the possession of one-seeded capsules. The deep position of the root and its woody nature are its main defects. *B. trigyna* is also highly polymorphic. The chromosome number in the Transcaucasian forms was $2n = 36$ (tetraploid), which number was also observed in some of the Crimean forms, others of which were hexaploid with $2n = 54$. *B. trigyna* has large roots and is very winter-hardy and is thus a desirable form for hybridization and it is thought probable that the discovery of the tetraploid forms will greatly increase the chances of successful crossing, since all the forms used by previous workers have apparently been hexaploid. A hybrid of the tetraploid form with *B. vulgaris* ($2n = 18$) is referred to in a footnote; the chromosomes of the two species can be distinguished morphologically in the hybrid and the *B. trigyna* chromosomes are seen to be in 9 identical pairs, shewing the species to be an autotetraploid. The hexaploid forms occur in the more westerly section of the area of the species, such as the Crimea and Hungary, and are evidently of later origin. The species has evidently extended to these countries after the origin of the hexaploid form.

B. macrorrhiza is a very old species endemic to Transcaucasia and Turkish Armenia, growing at 1,700—1,900 metres. It is diploid ($2n = 18$) and its chromosomes are the largest known in *Beta*; in morphology they resemble the other two species of the eastern group. It is possessed of remarkably large and tender roots, winter habit, frost resistance and forms no flowers in the first year. Its yield is therefore not inferior to the tetraploid *B. trigyna* and it is at the same time the earliest of the three species in maturity. Especial interest attaches to this species therefore for purposes of hybridization.

Illustrations are given of the various specimens collected.

967. FILATOVA, T. A. 633.63-1.524.4:581.43

(Root anatomy of the wild sub-species *Beta vulgaris* L.).

Naučnyye Zapiski Sakharnoi Promyshlennosti (Sci. Trans. Sug. Ind.) 1934 :

Nos. 4, 6: 11 : Nos. XLII, XLIV : 45-57.

Great variation has been observed within the species *B. vulgaris*. Reports are here given of an investigation of the root structure of thirteen specimens of wild beets embracing both subspecies *maritima* and *perennis* from various localities. The forms examined contained a number of valuable agronomic characters, including tolerance of cold, drought and salts, resistance to *Cercospora* and at times quite high quality of juice and sugar content and all crossed without difficulty among themselves and with the cultivated beet.

Descriptions and illustrations of the characteristic anatomy of the different types are given. The western European forms are perennial and excel the more southerly forms in cold resistance, in size of root and in sugar content, which reaches as much as 19 per cent, as compared with 15 per cent in the Italian and 12 per cent in the African forms. Both the African and the Italian forms have a better vascular system and better development of the parenchymal tissues; both contain individuals resistant to *Cercospora*. Oils have been detected in the roots of the wild as well as the cultivated forms, starch only in certain western European specimens of the subspecies *maritima*. The Italian forms are the nearest to the cultivated type (sugar beet and mangold).

968.

633.63-1.557:519.241.1

ORLOVSKY, N. I. and UMANSKA, L.V.

633.63:575-18

(Characteristic of beet sorts in connexion with the problem of selection).

Naučnye Zapiski Sakharnoi Promyšlennosti (Sci. Trans. Sug. Ind.) 1934 : Nos. 8, 10 : 11 : Nos. XLVI, XLVIII : 48-68.

Investigations were carried out on a number of varieties of beet of different types, observations being made on the development of each leaf during the entire life of the plant. A report is given of the most interesting of the data, which are also presented in tabular form. In the early growth stages the high sugar content beets had the lowest number of leaves per plant, whilst in the middle growth period the differences were less pronounced and by the end of growth the fodder beets had the least number of total leaves and the sugar beets the most. Similar differences were observed between the high and low sugar lines within the sugar beet. With the approach of the end of the growing period differences were noticed in the rapidity with which the leaves withered, the forage type withering most rapidly and the high sugar type least ; thus this latter type retained a much larger number of fresh leaves at the end of the growing period, though varietal differences were observed within each group : the varieties from the Ramon station for instance were characterized by high leaf numbers, presumably owing to leafiness having been one of the characters for which selection was practised at that station.

A positive correlation was observed between the number of leaves at the beginning of the growth period and the final weight of root, both when different groups and when varieties within each group or even individuals within a variety were considered. In the sugar beets a correlation of $r = +0.45 \pm 0.16$ was observed, whilst considering all varieties examined this coefficient was $r = +0.55 \pm 0.12$. The later leaf counts on the other hand gave very much lower or even negative correlations.

The assimilating surface in sq. cm. was calculated and it was found that at the beginning of the growth period it was least in the high sugar forms, increasing progressively to a maximum in the forage group, and this relationship gradually reversed in the later growth stages, so that at the beginning of September, the high sugar forms were in general highest. Thus a correlation of $+0.73 \pm 0.12$ was observed between the area of leaf surface at the beginning of growth and the total weight of root for the whole seventeen varieties studied and a correlation of $+0.65 \pm 0.18$ for the seven sugar beets alone, whereas the assimilating surface at the time of digging gave a correlation amounting to only $+0.19$. Similar differences were observed within the varieties. Figures are given shewing that within each variety the forms with the biggest leaves have on the whole the largest roots, while the sugar content remains more or less constant. Correlations of as much as $+0.74$ were observed in some varieties in the early growth periods but in the neighbourhood of $+0.3$ at the later dates. The existence of these correlations is extremely valuable from the point of view of the breeder and their limitation to the early period shews the need for careful control of the time of making any observations. Indeed the authors attribute many contradictory statements in the literature to lack of uniformity in the periods at which the observations have been made.

Observations were also made on the surface area per leaf in the first 15 mature leaves. The leaf area was greatest in the high yielding sugar beets and lowest in certain varieties of the high sugar type. Within the sugar beets there was a high correlation between size of leaf lamina and weight of root ($r = +0.77 \pm 0.12$) but this correlation did not apply if other groups of beet were also included.

The length of the petiole of mature leaves was greatest in the forage beets and least in the high sugar type of sugar beets and the correlation between the petiole length of the first ten leaves and the root weight was $+0.59 \pm 0.14$ for all varieties and 0.32 ± 0.22 for the sugar beets alone. An examination of the work of Šimanskii shews that this author's figures are in general agreement with the present ones, though he himself did not draw such conclusions from them. The authors conclude that the differences observed by them constitute one important factor among many possible factors contributing to the difference in behaviour of the different types ; the high yielding types have their maximum leaf activity at a time when vegetative activity is at its height while in the sugar type the maximum leaf activity coincides with the period when sugar

formation is in the ascendant. Besides being of theoretical interest in connexion with the mode of inheritance of quantitative characters, the correlations observed are thought to be of value for direct application in practical selection, since a great number of inferior seedlings can be discarded at an early date on the score of their type of leaf area and number in the early growth stages. Besides avoiding a great deal of unnecessary examinations of unsuitable forms the author claims that this method may prevent the selection of genetically unsuitable forms, the risk of which is brought about by the wide phenotypical fluctuation of the character root weight. The later stages of selection are done in full detail according to the root weight, polarimetric readings etc. of the individual plants. By the application of this method in 1927 the authors have succeeded in selecting a strain which exceeds both the initial strain and the standard varieties in productivity.

STIMULANTS 633.7

969. COOLHAAS, C. 633.71:575(92.2)
Jaarverslag 1 Mei 1933–30 April 1934. (Annual report 1st May, 1933–30th April, 1934.)

Meded. Proefst. Vorstenl. Tab. 1935 : No. 81 : Pp. 94.

Tobacco selection is still being carried on with the F_4 of the Deli 2 x Kanari (D1 2K) and the Deli-Kanari-Y 10 (D1 YK) crosses but no outstanding results have been obtained so far.

The Kanari x Kanari crosses in general shewed too much irregularity and lack of fineness but the best plots are to undergo further selection. The F_5 from KW 47 x KS 63 was poor and the best lines from the F_4 will have to be used for further work. One F_5 plot (No. 59) of KW 12 x KS 63 was regarded as good.

One KW 12 x KS 63 line (F_4) shewed double flowered types of good quality in spite of somewhat small leaves. These double flowered segregates and others from an F_5 of the same original combination are being crossed with Kanari for ultimate comparison with a number of Kanari-type selections from the same F_4 and F_5 groups.

F_6 selections among sib lines of E3K 57 and E3K 66 proved superior in certain plots to the E3K 57, F_6 and the E3K 66, F_6 which up to the present have been the best of the EK-Kanari back-crosses.

The F_2 from the new EK cross, E x KBS has already proved very promising.

The Timor x Kanari cross has been re-crossed first with E3K 66 and then with KW 10 and the F_3 exposed to infection with *Phytophthora*. A considerable number of plants of very good quality survived and are being used for further work ; and it is hoped that a line much less susceptible than the Kanari and of satisfactory quality will soon be available for distribution.

The varietal tests for the year in question served mainly for preliminary comparisons of certain mutants, mainly the F_1 B chlorina x KW 10 and some of the best KK lines with a number of recognized lines. In addition the two new lines Chlorina x KW 10 and KBS, the latter already noted for its quality, were grown in variety trials on various estates. In general Chlorina x KW 10 has received very favourable comment both in the Indies and Holland and mainly on account of its brightness and dryness. Its good quality does not appear to be limited to any special type of soil. The burning properties were in general very good, though in one plot the length of the burning time seemed to be less than for the KBS types. For this reason B-chlorina x KBS is to be included in the test plots next year beside B-chlorina x KW 10. The reports obtained for KBS in tests at various places were somewhat conflicting, due possibly in certain instances (e.g. Holland) to the fact that this line, owing to the high water absorption of its leaves, deteriorated en route.

On the whole it would seem that Chlorina x KW 10 is extremely promising, combining as it does the brightness and dryness of the Chlorina mutant with the leafiness, suppleness and good burning properties of KBS.

A number of KK selections are being tested and one F_5 KW 12 x KS 63 ranked first and second respectively in plantings with KBS, B-chlorina, B-chlorina x KW 10, A-chlorina and other types. On the other hand, a broad-leaved F_4 KW 47 x KS 63 was a failure owing to irregularity and insufficient refinement of type in estate trials.

The variety tests in relation to soils were continued ; and duplicate trials bearing on the methods of sampling and gathering the crop were carried out by the Proefstation voor Vorstenlandsche Tabak and the Klattensche Cultuur Maatschappij.

970. SMITH, H. H. 633.71:575.11.061.6:575.11-181
The relation between factors affecting color and size in certain species of *Nicotiana*.
 Amer. Nat. 1936 : 70 : 65-66. (Abst.)

Seven genes with major effects on anthocyanin colour, one gene for chloroplast colour and two complementary genes causing blue pollen were studied in crosses between *N. Langsdorffii* and *N. Sanderae* (Sutton's Scarlet). The inheritance of corolla size was also studied, *N. Langsdorffii* having a small and *N. Sanderae* a large corolla. The F_2 distribution was approximately normal when the data were compared on a logarithmic scale, the results being compatible with a multiple factor hypothesis.

Each of the genes from Sutton's Scarlet was found to be associated on the average with larger corollas in the F_2 generation, indicating linkage between qualitative and quantitative characters. A progressive increase in corolla size was obtained by adding single colour factors one at a time from the larger parent.

Of the many size factors involved some, if not all, operate without dominance and none have detectable major effects. Many appear to be additive while others interact.

971. 633.71:575.243:537.531
 633.71:575.243:581.04
 635.646:537.531
 633.842:537.531
 633.491:581.04

TERNOVSKY, M. F.
 Ergebnisse der Versuche künstliche Mutationen bei einigen *Solanaceae* zu erhalten. (Results of attempts to obtain artificial mutations in certain *Solanaceae*.)
 Genetica 1935 : 17 : 499-546.

Flower buds of *Nicotiana Tabacum* plants highly inbred were treated with ether, chloroform and X-rays respectively. No mutations were obtained from the ether or chloroform treatments. X-ray irradiation resulted in mutations affecting many characters, e.g. general appearance, size and form of flower, length of vegetative period, breadth of leaf (generally reduced), sterility, haploidy, etc., due to chromosome aberrations resulting in heteroploidy, fragmentations, etc. and gene mutations. No polyploids or vegetative mutations were found.

Young buds were much more sensitive to the treatment and as compared with the male gametophyte, irradiation of the female gametophyte resulted in more numerous mutants; but in both sexes the number of mutations increased with the dose. It is also believed that the mutation reaction under X-rays is specific for the genotype.

Flower buds of *Solanum melongena* L. and of pepper were also irradiated but all dosages proved lethal to the first named and only one bud survived. The resulting 18 pepper plants shewed no abnormalities, nor did the X_2 generation.

Irradiation as a method of producing mutations of economic value could only be applied for plants vegetatively reproduced.

972. POVOLOČKO, P. A. 633.71:576.356.5:578.08
An autotetraploid of *Nicotiana sylvestris* obtained by regeneration effected by growth hormones.
 C.R. (Doklady) Acad. Sci. U.R.S.S. 1935 : 4 (IX) : 77-80.

Nicotiana is incapable of producing regenerated shoots after surgical operation and Kostoff's attempts to induce this by means of *Bacterium tumefaciens* have also failed. By applying the pollinia of certain tropical orchids, containing a particular hormone, to the cut surface the author has succeeded in inducing the formation of regenerated shoots in both *N. Tabacum* and *N. sylvestris*. One of the plants of the latter species, which survived the winter of 1934-35, produced a tetraploid shoot with 48 chromosomes. The tetraploid plant obtained from it was smaller than the diploid regenerates of the same plant and was different in many other respects.

The function of the hormone is supposed to be the stimulation of the growing point of the cut stem, which under normal circumstances is replaced by the growing points of axillary buds.

973. WHEELER, H. -M. 633.71:582(94)
Studies in *Nicotiana*. II. A taxonomic survey of the Australasian species.
 Univ. Calif. Publ. Bot. 1935 : 18 : 45-68.

Hitherto the indigenous Australasian species of *Nicotiana* have generally been treated as a simple polymorphic species *N. suaveolens* Lehmann, but study has now been made from living plants and herbarium specimens with the object of evolving a suitable classification for the Australasian members of the genus. The special morphology, a key to the species and description of the species are accompanied by certain data (obtained from the University of California) on chromosome numbers; but the cytological and genetic studies in progress will be reported elsewhere.

974. HOLMES, F. O. 633.71-2.8-1.521.6:575.127.2
Necrotic response to tobacco-mosaic infection in *paniculata*-like segregates from *Nicotiana paniculata* x *rustica*.
 Amer. Nat. 1936 : 70 : p. 53. (Abst.)

N. paniculata responds to infection by tobacco-mosaic virus by mottling without necrosis, *N. rustica* and *N. undulata* being as far as is known the only species of *Nicotiana* whose response takes the form of systemic necrosis. The latter type of response has been secured in self-fertile, *paniculata*-like segregates from the cross *N. paniculata* x *rustica* obtained by repeated back-crossing using *paniculata* pollen.

975. (The work of the Institute. Plans for work in 1935). 633.72:575(47)
 Bull. Res. Inst. Tea Ind. U.S.S.R. 1935 : No. 4-5 : 105-10.

In the breeding section mass selection has been executed on acclimatized and introduced foreign varieties, the question of photoperiodism is being studied as a means of accelerating breeding and a micro-chemical study of the tea plant is being made to discover the reason for differences in frost resistance.

976. KARASAWA, K. 633.72:576.356.5
On the somatic chromosome number of triploid *Thea*.
 Jap. J. Genet. 1935 : 11 : p. 320.

In root tips of *T. sinensis* var. *macrophylla* 45 somatic chromosomes were found. This strongly suggests that the variety is a triploid. (Cf. "Plant Breeding Abstracts," Vol. III, Abst. 258).

977. FREIRE, C. V. 633.73(81)
 Contribuição ao estudo histológico dos cafeeiros no Brasil. (Contribution to the histological study of the coffee bushes of Brazil).
 Rev. Dep. Nac. Café, Rio de J. 1935 : 3 : 829-31, 1007-08.
 A continuation of the previous articles (Cf. "Plant Breeding Abstracts" Vol. VI, Abst. 228), this time describing *Coffea congensis*.

978. KUZMINA, N. E. 633.75:576.312.34:576.16
[Cytology of the cultivated poppy, (*Papaver somniferum* L.) in connexion with its origin and evolution.]
 Bull. Appl. Bot. Leningrad 1935 : Ser. 2 (8) : 81-92.

Cytological examinations of possible ancestors of the cultivated poppy ($n = 11$) among the neighbouring species have definitely excluded *P. glaucum* in which $n = 7$, and also *P. setigerum*, which genetically stands very close, has been excluded as a direct ancestor on the score of its number $n = 22$.

The chromosome size and form of a number of varieties of cultivated poppy were studied by Levitsky's method and the data for the individual chromosomes are presented. A weed form (*P. somniferum* ssp. *subspontaneum*) from Spain proved different from the cultivated varieties

examined in several respects. Several of the chromosomes were longer and in three chromosomes the short arm was less reduced in length, so that the proportions between the arms were more nearly equal. The same kind of differences were observed in a weed form from Novgorod. The reduction in chromosome length in the course of evolution has been observed in a number of plants by Levitsky and his school and the differences between the cultivated and wild poppies are thought to be an illustration of the same phenomenon.

OIL PLANTS 633.85

979. SELIBER, G. 633.85:633.491
(A field of potato seeds).

Bull. Appl. Bot. Leningrad 1935 : Ser. A (14) : 157-58.

Examinations of the seeds of a number of potato varieties have disclosed the presence of considerable quantities of oil ; for instance seeds of *S. tuberosum* contained an average of 36.5 per cent of oil with an iodine number of 134, and seeds of *S. andigenum* 33.8 per cent with iodine number 132. Further observations are being made to find whether this fact will be of industrial application in the search for sources of oil.

980. GRANER, E. A. 633.854.56:576.312.35
Notes on the chromosome number and morphology in root tips of
tung (*Aleurites Fordii*, Hemsl.).

Arch. Inst. Biol. Veg. Rio de J. 1935 : 2 : 81-82.

In the root tips of germinated seeds of *Aleurites Fordii* Hemsl. the somatic number of chromosomes was found to be 22. Their sizes range from 1.5 μ to slightly over 2.5 μ and the attachment constriction, judging from the shapes of the chromosomes, was often median or sub-median. There was a slight tendency to somatic pairing.

981. KUPTSOV, A. I. 633.854.78:577.812:581.162.51
(A uni-sexual female sunflower).

Bull. Appl. Bot. Leningrad 1935 : Ser. A (14) : 149-50.

A sunflower from Benares was distinguished from the rest in 1929 by the failure of the stamens to emerge from the flowers. Bagged inflorescences of this plant set no seed at all but when pollinated with pollen from normal plants a perfectly normal set of seed was obtained. These seeds when sown also produced normal plants. These plants were grown together in an isolated patch in 1931 and produced an F_2 in 1932 in which the male-sterile forms again appeared in the proportion of 1 : 2, evidently being conditioned by a recessive gene. The characteristics of the new type are that its stamens do not develop fully, the pollen sacs do not swell and the stamen filaments elongate much less than in normal flowers. It is of value for crossing in that it does not require emasculation.

By pollinating such a plant with the F_1 heterozygote equal numbers of female and normals are obtained and the type can be maintained by sowing such a population in an isolated space.

RUBBER PLANTS 633.9

982. FERRAND, M. 633.912:575
L'amélioration de l'Hévéa. (The improvement of Hevea.) 633.912:575.42
Bull. Agric. Congo Belge 1934 : 25 : 149-91.

Following some remarks on the origin and variability of *Hevea brasiliensis* and the characters determining the productivity of the rubber plant an account is given of the method of selecting mother trees by regular and careful observation combined with tapping tests taken at intervals for three years. The relative value and technique of selecting clones as compared with the results obtainable by sexual reproduction are then discussed, with illustrations from various Dutch and other authorities ; and botanical and biochemical methods of identifying clones are explained. In treating the problems and technique of selection from sexually reproduced material it is

recommended that both self- and cross-pollination of carefully selected parents should be used and at the same time isolated test plots of clones from mother trees should be established; then the generations from seed and clones can be subsequently compared.

About double the number of individuals ultimately required should be planted in the first instance to allow for eliminations at various stages of the test.

The results so far achieved by selection from seedlings, though far from complete, shew promise of great progress in the future but vegetative selection is to be regarded as a valuable aid in hastening the advance.

983.

HALL, C. J. J. VAN

Review of the more important publications on rubber cultivation issued in 1934.

Int. Rev. Agric. Rome 1935 : 26 : T 419-44.

633.912-1.557:575

633.912:575.42(92)

Statistics are given, taken from Cramer, of the areas planted with budgrafts and seedlings respectively in the Dutch Indies, Malaya, Indo China and other countries.

Cramer believes the average yield per hectare for budgrafts is at least twice the normal yield from common plantings, i.e. about 100 kg. per hectare on the average.

Cramer holds that a careful choice of clones is essential in order to obtain the highest yield under the prevailing conditions of climate, soil, etc., and he gives some particulars of the characteristic features of a number of Avros and other clones as well as the relative performance of a number of clones from Java, Sumatra and Malaya in Indo-China. In the latter test Tjirandi 3 has proved the most vigorous grower, Tjirandi 1 appears sensitive to drought and shews little resistance to wind. Avros 49 and 50, however, are practically uninjured by storms.

Clonal variation also occurs in the density of crown and in disease resistance; Avros 50 and BD 5, having very open crowns, are very suitable for planting in mixed cultivation with coffee as they do not throw too dense a shade. The time when trees become ready for tapping as well as suitability for being budded also differs with the variety.

According to Maas selection work on the Government rubber estates in the Dutch Indies has yielded 925 trees for registration out of the 3,754 mother trees originally kept under observation. Of these the 260 best have been finally retained as material for bud grafts; their average yield is 5 kg. of dry rubber per year and the maximum yield was over 30 kg. The new clones are tested in row experiments and compared with well-known clones; finally the best of these new clones are tested in plot experiments.

Vegetative selection also includes a study of the most suitable stocks and crowns; so that a tree may consist of a selected stock, a selected scion and a selected crown which may be resistant to mildew or wind.

The next process is sexual selection which has yielded progeny from 18 crosses between selected trees; numerous clone seedlings are also to be tested, and a number of clones have been planted in isolated seed gardens.

A complete report of yields of some hundred clones is to be given later.

Some of the relations between yield and tapping are exemplified by reference to literature on data from Java and Malaya.

Angenot's work on the technique of pollination (Cf. "Plant Breeding Abstracts" Vol. V, Abst. 153) is fully described and compared with the results obtained by other workers including Pieris (Cf. "Plant Breeding Abstracts" Vol. V, Abst. 30).

Recent data from the Dutch Indies have shewn that with proper methods of upkeep and tapping an average production of about 3 kg. rubber per tree and increase to about 4 kg in the fourth year may be obtained from fields planted with unselected seedlings; moreover an increase in yield up to the twentieth year is not exceptional.

Further data, also from the Dutch Indies, indicate that very satisfactory yields can be obtained from uncontrolled seedlings of selected mother trees, from 204-469 kg. rubber (average 371 kg.) being cited as the output at 5½ years; and one field at 10½ years yields 1,119 kg. per hectare.

Evidence is also cited confirming the general view that the yields from seedlings from carefully selected families compare favourably with those of the best clones.

FRUIT TREES 634

984. RUDLOFF, C. F. 634:575(43)
 Obstzüchtung. (**Fruit breeding.**)
 Naturwissenschaften 1934 : 22 : 501-04.

A broad outline of the work and methods of the Fruit Section of the Kaiser Wilhelm Institute for Genetic Research. The investigations fall into two classes : (1) the establishment of clones and lines of stocks for the main classes of fruits and the various orchard requirements ; and (2) the improvement of German varieties in regard to yield, quality, resistance to disease and cold, etc.

General methods and difficulties in fruit breeding are referred to and the mode of procedure in breeding for *Fusicladium* resistance in apples is exemplified.

985. 634:575.127
 (**I. V. Michurin 1855-1935**).
 Naučnoe Plodovodstvo (Scientific Fruit Growing. Bull. Lenin Acad. Agric.
 Sci., Res. Inst. Fruit Grow. I. V. Michurin) 1935 : No. 3 : xiv-xv.
 Obituary notice with outline of Michurin's life and work.

986. GUROV, P. 634:575.127
 (**The work of Ivan Vladimirovich Michurin**).
 Sotsialističeskaja Rekonstruktsija Sel'skogo Khozjaistva (Socialist Recon-
 struction of Agriculture) 1935 : 7 (1) : 172-85.

The principles underlying the late I. V. Michurin's work form the basis of this obituary notice of him. Michurin criticized the old methods especially for their reliance on selected varieties introduced from abroad, often from much milder climates ; his method was to introduce suitable parents and by hybridization and other methods to produce from them forms adapted to each individual region. The experience of a lifetime led him to the method of repeated back-crossing to a high quality type after crossing between local hardy forms and imported selected varieties. More distantly related parents are more likely to give seedlings suited to a new environment than more closely related ones ; plants growing on their own roots are more successful parents than those grafted on to wild species ; plants at the height of their vegetative vigour transmit their qualities most successfully to their hybrids ; the hybrids should not be grown on too rich soil ; seed material should not be taken from too large fruits ; the high quality varieties used as parents should be of recent origin ; the local forms used should always be frost resistant ; the characteristics of distant progenitors, in addition to those of the immediate parents, may appear in the progeny—these are some of Michurin's conclusions based on his practical experience. The conditions of growth, even the conditions of a particular year, are thought to influence the degree in which the qualities of a particular parent are transmitted, and the same applies to the conditions under which the young hybrids develop.

Michurin's success in interspecific and intergeneric hybridization is referred to (Cf. " Plant Breeding Abstracts," Vol. V, p. 376) and also the method of vegetative *rapprochement* (Cf. " Plant Breeding Abstracts," Vol. V, Abst. 1106) and the " mentor " (Cf. " Plant Breeding Abstracts," Vol. V, p. 376). In the latter connexion the much greater adaptability of young organisms than mature ones is mentioned ; Michurin has extended this to the case of young hybrids, claiming that these are susceptible to influences of a hereditary nature through grafting and other external agencies known to be perfectly ineffective at a later stage of development. In selecting the hybrid seedlings Michurin paid attention to all characters of the plant : thus examination and selection are carried out in the cotyledon stage, the three year sapling stage and finally on fruit characters. Resistance is an important feature at all these stages. Michurin succeeded in producing forms suitable for the severe conditions of Central Russia in about ten different species but has left indications of a number of other species which are highly promising in this respect, including Manchurian peaches ripening in the middle of October and withstanding -33°C. in winter, and his successors are encouraged to carry on the work on the lines laid down by him.

987. RIOLS, P. 634:581.162.5
 Les causes d'infertilité et la mise à fruit chez les arbres fruitiers. (**The causes of infertility and the setting of fruit in fruit trees**).
 Vie Agric. Rur. 1935 : 24 : 361-65.
 Various external and internal causes of deficient fertility are cited with a note on the inherent self-sterility of certain varieties.
988. CROWELL, I. H. 634.1/2-2.452-1.521.6
 635.9-2.452-1.521.6
Ornamental apples and cedar rust.
 Horticulture 1935 : 13 : p. 515.
 A note on the ornamental species and varieties of *Malus* that are immune or highly resistant to attack by cedar rust diseases.
989. *LIKHOVITSER, V. G. 634.11:576.312.35:581.142
 634.11:576.16
(Remarks on the karyotype of the apple).
 Nauchnoe Plodovodstvo (Scientific Fruit Growing. Bull. Lenin Acad. Agric. Sci., Res. Inst. Fruit Grow. I. V. Michurin) 1935 : No. 2 : 66-68.
 In connexion with an investigation of hybridization between distantly related forms the chromosome number of four Russian varieties of apples was determined and all four were found to have the normal diploid number 34. A comparison of these data with Vasil'ev's findings on the germination capacity of the pollen of three of the varieties in question shewed that normal chromosome complement was associated with normal germination capacity.
 Further cytological research on the chromosome complement of the apple would be of both practical and theoretical importance since it would yield useful information on the likelihood of abnormal reduction divisions and consequently on the potential value of the varieties as pollinators and possibly also on the phylogeny of the apple.
990. BRYANT, L. R. 634.11:581.162.3:581.331.1:576.356
A study of the factors affecting the development of the embryo-sac and the embryo in the McIntosh apple.
 Tech. Bull. N. H. Exp. Sta. 1935 : No. 61 : Pp. 40.
 Emasculated flowers of the McIntosh apple ($2n = 34$) were pollinated with Gravenstein ($2n = 51$), Baldwin ($2n = 51$), McIntosh and Delicious ($2n = 34$) pollen respectively and studies were also made on emasculated unpollinated flowers and on unemasculated open pollinated flowers. In general the first three pollinations mentioned were ineffective in securing a set of fruit and the object of the study was to find reasons for this.
 It was found that any pollination retarded degeneration of the contents of the embryo sac but that signs of degeneration were observed earlier in the ineffective pollinations than in the case of pollinations with Delicious pollen, which were very effective in producing a set of fruit.
 Even in the ineffective pollinations, however, pollen tubes were observed to enter the embryo-sac and double fertilization took place as in the effective pollinations. Later the embryos produced all aborted except in the case of pollination by Delicious. It is suggested that embryo abortion after pollination by Gravenstein or Baldwin may be due to chromosome irregularities in the pollen of these triploid varieties. In the case of self-pollination the cause of abortion is not clear but it is considered unlikely that self-incompatibility factors of the type causing differential growth rates of pollen tubes in the stigma are the cause either in this or the other ineffective pollinations, since it was demonstrated that at least some of the pollen tubes do reach the embryo-sac and bring about fertilization.

* A full translation of this paper is on file at the Bureau.

991.

634.2

634.2-1.524

634.2:575.127

*KOVALEV, N. V. and KOSTINA, K. F.

[A contribution to the study of the genus *Prunus* Focke. (Questions of taxonomy and plant breeding).]

Bull. Appl. Bot. Leningrad 1935 : Ser. 8 (4) : Pp. 76.

Up to the present only twenty-five of the total 301 existing species of the genus are known in cultivation, many even being known only by means of herbarium specimens. The present monograph represents the beginning of a more exhaustive study of the genus and its respective species.

The first chapter deals with the systematics of the genus *Prunus* according to a number of different botanists. The authors adopt the systems of Tournefort and others in which the different groups *Armeniaca*, *Cerasus*, *Amygdalus*, etc. are classed as independent genera. Nevertheless parallel variation occurs in nearly all characters, to such an extent that it occasionally even obscures the lines of demarcation between the species or even between the different sections, sub-genera and occasionally genera and a series of intermediate forms is usually found to exist between each of these groups. Examples of this are cited.

Representatives of the *Prunus* group are found in the most varied habitats, from the tropics (*Laurocerasus*) to the tundras of Europe and Asia where the temperature falls to -40 to -60°C . (*Padus*). Although the total number of representatives of the various genera present in the Soviet Union is relatively small, yet the Soviet territory contains the majority of the wild forms which have served as progenitors of the present cultivated species, with the exception of *Persica*, the only genus with its centre of origin outside the U.S.S.R.

Examinations are being made of all this material from the point of view of its possible value for breeding and introduction. Remarkable variation has been found in sugar content, oil content, time of maturity, etc. in the different forms. The vast majority of the apricots of Central Asia have moreover been found to possess sweet kernels. However, the main problem of *Prunus* cultivation in the U.S.S.R. is to produce hardier forms capable of growing further north and it is for this reason that special attention is directed to the forms growing in countries with a rigorous climate. Thus in connexion with the peach the species growing in eastern China are hardy and great hope is entertained of the species *P. mira*, *P. Davidiana*, etc. and their hybrids. In plums attention is being turned now to the myrobalan, *P. cerasifera*, which is of interest for breeding on account of its great productivity, resistance to disease, to drought and heat, early maturity of fruits, tolerance of unfavourable conditions and firmness and good transportability of fruit. The greatest cold resistance is found in *P. spinosa* and *P. institia*, which easily tolerate -30°C . and more; and *P. ussuriensis* is interesting in this same respect. In the cherries the only forms suitable for the north are the hybrids produced by Michurin, including certain hybrids between the sweet and sour cherries. These can be grown as far north as Moscow. Some of the Chinese and Japanese species are also promising. The same applies to the far eastern apricots and reference is also made to *Armeniaca sibirica*, which withstands temperatures of -50°C . A great wealth of local forms, characterized by very high sugar content, occurs in Central Asia, which forms yield twice as much dried fruit as the common European varieties. There are also forms with earlier and later maturity capable therefore of extending the season of productivity. It is hoped that by using *Amygdalus nana* it will be possible to extend the limit of almond cultivation at least 1,000 km. further north. *A. bucharica* and, especially, *A. spinosissima* and *A. scoparia* are characterized by remarkable drought resistance.

The study of the geographical distribution of the stone fruits has thus revealed the centres of their specific and varietal diversity and the existence of innumerable forms not previously known, many of which are of extreme importance either for introduction or as material for breeding. In the zones of greatest specific diversity cases of natural hybridization between different species and even genera are quite frequent, a number of examples of this being described. Some of the most interesting of these are the natural hybrids of *P. cerasifera* and *P. spinosa*

found by Rybin in the North Caucasus. These are largely intermediate in character between the two species and cytological examination has shewn them to be intermediate in chromosome number too, being triploids with $2n = 24$. Similar hybrids have since been obtained by Rybin artificially but one of them differed from the rest in habit, leaf characters and its high fertility. It proved to be hexaploid with $2n = 48$ and has furnished a remarkable confirmation of Darlington and Crane's assumption as to the origin of *P. domestica* by chromosome duplication in a sterile hybrid of these two species.

Others of these interspecific hybrids are of interest in being more hardy and disease resistant than the normal forms, as in the well-known *P. dasycarpa*, now shewn to be hybrids between the myrobalan or plum and the apricot. Similarly with the natural hybrids of the almond and peach. One of these has juicy, edible fruits, hardly inferior to the local peaches, combined with the almond type of leaf and a sweet edible kernel of the almond type and gives a very great variety of segregates in the later generations.

The results of artificial hybridization are considered and the work of Michurin in this field is described, followed by the work of various investigators in America, England and other countries on hybridization and in pure genetics and cytology in this group. All this work shews the great possibilities of interspecific crossing in this group. By applying the methods of back-crossing and Kostoff's "bridging" hybrids still further possibilities should be disclosed. Many more promising species still remain to be tried and much still remains to be done on the theoretical side before finally arriving at a satisfactory theory of hybridization in the *Prunus* group. Crosses of the sweet cherry with Alderman's hybrid *C. Besseyi* x *C. pennsylvanica* are of great promise for producing cold-resistant sweet cherries; the same applies to the plum hybrids between *P. nigra* and *P. salicina*, and Henderson has shewn that *P. salicina* is capable of fertilization by *P. domestica* and also by *P. americana* and *P. nigra*. Cytological examinations have now been made of a number of Michurin's and other hybrids, and the results are outlined. An appendix gives the genera of *Prunus* Focke arranged according to Koehne, with indications of the countries in which each occurs.

992. MEIER, K. and BRYNER, W. 634.22 Ruth Gerstetter
 "Ruth Gerstetter," eine neue Frühzwetschge. ("Ruth Gerstetter," a new
 early plum.)
 Schweiz. Z. Obst- u. Weinb. 1935 : 44 : 317-20.

The new plum which originated from the cross Czar x Gute aus Bry is described. The fruit ripens in Wädenswil towards the end of July and would no doubt ripen earlier still in warmer localities.

993. TUCKER, L. R. 634.23:581.47:575
 A varietal study of the susceptibility of sweet cherries to cracking.
 Bull. Idaho Agric. Exp. Sta. 1934 : No. 211 : Pp. 19.

The eight varieties tested for comparative susceptibility to cracking finally were classed in the following order ranging from susceptible to resistant: Bing, Tartarian, Napoleon, Lambert, Republican, Oregon, Waterhouse and Eagle. Varieties with large fruits were more susceptible to the defect than those with small fruits; similarly varieties with little skin per gramme of soluble solids in the fruit were more susceptible than varieties with large amounts of skin.

It is suggested that by breeding and selection, the skin thickness—one of the various characteristics determining the amount of skin—might be altered without affecting the market quality of the fruit.

994. BLAKE, M. A. 634.25 Hardee
 634.25:575(74.9)
 The new Hardee peach.

Annu. Mtg. Program No. N.J. Hort. Soc. News 1935 : 16 : p. 762.

The Hardee has yellow flesh, ripens about the same time as Elberta and is oval in shape like the Belle variety but resembles Elberta in the type of pit.

995.

634.25:581.6:575

MOON, H. H., CULPEPPER, C. W. and CALDWELL, J. S.

Varietal suitability of peaches for preserve making and factors affecting the quality of the product.

Circ. U.S. Dep. Agric. 1935 : No. 375 : Pp. 22.

Sixty-seven varieties of peaches comprising about 40 freestone with melting flesh, about 20 clingstone with non-melting flesh and some intermediate types were tested for colour, texture and degree of disintegration of the fruit, consistency and flavour, when used in making preserves. As a group the non-melting fleshed varieties, (owing to the very much greater solution of the cell walls and formation of soluble pectin which occurs in the melting fleshed types) yielded a superior product as compared with the melting fleshed type.

Considerable differences between the varieties within the various groups were also evident. Early Elberta, Ideal, Paragon and Tuskena were regarded as the best, but were closely followed by Motion Cling, N.J. 92615, N.J. 97815, Foster and others. In addition varieties of closely related groups such as those resembling the Crawford or the Elberta differed markedly in many of the test characteristics, thus indicating that suitability for preserving purposes is determined by individual varietal characters.

996.

634.3:575(47)

634.3:575.127

634.3:576.16:581.9

KOJIN, A. E.

(Principal problems in *Citrus* selection).

Soviet Subtropics 1934 : No. 4 : 27-44.

A study of the literature of sterility shows that absence of seeds in *Citrus* fruits may be due either to sterility proper—the failure to develop normal male or female organs—or to incompatibility. The proportion of apogamous to fertilized embryos varies in different varieties, in some attaining very high proportions, up to 90–100 per cent. It is desirable in hybridization work, therefore, to choose maternal parents of a variety with as low as possible a proportion of apogamous embryos. For purposes of propagation and maintaining a uniform stock, e.g. of rootstocks, the occurrence of apogamy is a great advantage. In order to distinguish the hybrid from the apogamous seedlings in crosses it is proposed that some chemical method should be evolved whereby the presence of the male parent could be detected at an early stage.

Considerable variation is observed in the progeny of crosses even between the same form, and much more still in the F_1 hybrids between two different species or genera, shewing the extreme heterozygosity of all these forms. The complex hybrids obtained by Swingle and others are referred to in this connexion. The possibility of obtaining these distant hybrids and such wide variation is largely ascribed to the presence of the same chromosome number in the different species and genera, all representatives of the group so far examined having 9 haploid chromosomes with the exception of *Fortunella Hindsii* with $n = 18$. The occurrence of this tetraploid, however, suggests the possibility of getting sterile triploid or aneuploid hybrids, in this way producing the much desired seedless kumquat. The occasional tetraploid forms that have been found among the apogamous seedlings of other species are thought to be of equal interest for breeding and it is not improbable that they may prove to be richer in vitamins than the diploid forms, as is the case in tomatoes, apples, etc. It would be of special interest to cross them with the lime, the species of least vitamin content, *C. aurantifolia*.

The importance of bud variation is touched upon and the merits of various methods of bud selection are discussed. Reference is made to the inferior nature of most of the bud variants so far known and to the negative results of experiments to produce desirable bud mutations artificially.

The remarkable responsiveness of *Citrus* varieties to small changes of environment makes it necessary in all *Citrus* breeding to carry out observations only on the locality for which the varieties are designed. The major factor determining success in breeding is the choice of suitable initial varieties. The main centre of diversity of the *Citrus* fruits is, according to Tanaka, in Assam and Northern Burma, extending along the eastern slopes of the Himalayas to the borders of China ; a second centre lies in northern India and a third in Peninsular India. Another

important centre for a different group, the subgenus *Metacitrus* Tanaka, occurs in central China, along the Yangtze Kiang valley, and a second Chinese centre, embracing the genus *Fortunella*, occurs in southern China and the neighbouring islands. The Indian centre extends to the Malay Archipelago and some of the Pacific islands and in all these different countries, as well as in India itself, innumerable endemic varieties occur. The Indian group of mandarins is represented in China and has also given rise to the Japanese group. Although China is the home of the orange, however, very little variation is found in the oranges either of China or any other eastern country and their present diversity must have arisen after their introduction to the Mediterranean and other countries. On the other hand the highest quality Chinese oranges are unknown elsewhere and are of undoubted interest for introduction. Two other Chinese forms are of particular interest in having edible fruits combined with extreme cold resistance, namely *C. junos* and *C. ichangensis*; also the Canton lemon (*C. limonia* Osbeck), Meyer's lemon and many species of *Fortunella*. The Chinese *Citrus* are also of importance on account of their disease resistance.

Citrus fruits have been introduced from these primary centres of origin to many other countries, sometimes several centuries ago, and have in many of them found secondary centres of form development, as in Arabia, Mesopotamia, Persia, Asia Minor, Palestine, Egypt, northern Africa and southern Europe. Some of the forms of these countries are of interest to the U.S.S.R., as for instance certain Spanish and Italian varieties for their earliness, the Clementine tangerine of Algeria for its cold resistance, etc., etc.

Japan also represents a secondary centre, the most interesting of whose forms are the Satsumas, especially the Wase which is relatively cold-resistant and very early; also the variety Koyi-Mikan (*C. leiocarpa* Hort. ex Tanaka) and the wild *C. tachibana* Tanaka which is cultivated in the extreme north of Japan and in the mountains. Some of the Japanese pomelos are also fairly cold-resistant, as also the grapefruit-like *C. natsudaïdai* and a number of hybrids such as *C. tamurana*, *C. medoglobosa*, and others mentioned by Tanaka.

The new centres of *Citrus* cultivation in America, South Africa, Australia, etc. have also a few promising cold-resistant forms, such as the early form Thomson of the Washington Navel orange and a number of Florida varieties, the Villafranca lemon, the Silver Hill mandarin, various grapefruits and a number of new hybrids such as the tangelos, citrangequats, limequats and citranges. In Australia the greatest interest attaches to the indigenous species *Eremocitrus*, with edible fruits and high cold resistance.

In view of the immense variation in the existing *Citrus* species, of the results of hybridizing in America and of the results in other crops it is thought that crossing between ecologically distinct but systematically nearly related forms will provide the most promising lines of improvement. The lines of work suggested for improvement for the purposes of the Soviet Union are outlined for mandarin, lemon, orange, grapefruit, kumquat and citron, and a scheme for a general breeding programme is presented. For the U.S.S.R. the main essential is to obtain early maturing varieties which at the same time possess a sufficient degree of cold resistance to make their cultivation possible within Soviet territory.

997.

STEHBER, K. E.

634.3:581.162.3

634.3:575.127

(The technique of hybridizing citrus trees).

Soviet Subtropics 1934: No. 3: 29-36.

One of the difficulties in the use of *Poncirus trifoliata* and *Fortunella japonica* as frost-resistant parents in *Citrus* crosses is the fact that the former flowers in March-April, the latter in July-August, whilst all the *Citrus* forms, with the exception of the lemon, which flowers all the year round, flower only in May-June. It is possible with suitable greenhouse accommodation to accelerate flowering in most forms so as to coincide with *P. trifoliata* but it has never been possible to produce the necessary acceleration in *Fortunella* to make crossing possible and with this and with most other species it is usually necessary to have recourse to preservation of pollen in desiccators. The best methods of collecting and preserving the pollen are described. By keeping in calcium chloride desiccators in the dark, pollen of the shaddock (*C. maxima*) gave 2.10-11.67 per cent germination after 20 days and pollen of *P. trifoliata* retained its viability for 61 days.

In 1932 and 1933 *P. trifoliata* flowered a second time late in the season and crosses were made between it and *Fortunella japonica*; the hybrids produced are more suitable for pollinating with the other *Citrus*.

Owing to the low percentage of fruit set from flowers pollinated in *Citrus* it is recommended that about 7-10 flowers be placed in each bag, the flowers being half from one parent and half from the other, and that the young fruits should be carefully thinned both on the bagged and non-bagged portions of the tree. Certain pollen-sterile forms such as the Satsuma, Washington Navel, etc. can be pollinated without previous emasculation. The normal method of carrying out artificial pollination is described. Parchment bags should not be left on the pollinated flowers for more than 7-10 days, otherwise the flowers will be damaged and the young fruits will fall.

The seeds must be sown immediately after removal from the ripe fruit since they rapidly lose their germinating capacity.

998.

OPPENHEIMER, C.

634.3:581.163

634.31:581.163:581.162.32:575

On citrus fertilization with special reference to seediness and seedlessness of the Jaffa orange.

Hadar 1935 : 8 : 261-67, 291-96.

The first part of this article is devoted to a review of work on parthenocarpy, apogamy, pollen fertility, self-sterility and related phenomena in *Citrus*.

The second part deals with the author's investigations on the influence of cross-pollination on the production of seeds in the Shamouti orange. Hand cross-pollinations and also observations on trees growing near other *Citrus* forms showed that cross-pollination by the orange varieties Baladi, Valencia, Lu-Gim-Gong, all the tangerines except Satsuma, Duncan Grapefruit and the Sour Orange increased the average number of seeds per fruit, while Sweet Lime, Lisbon lemon and March grapefruit appeared to be without effect in increasing seed production.

Variations observed, however, in the number of seeds per fruit on trees which were self-pollinated, often correlated with differences in percentage germinability of pollen indicated that genetical differences in respect of seed production may also exist. This suggests the possibility of improving plantations by bud selection.

Environmental factors also appear to influence seed production.

999.

SHLYKOV, G. N.

634.3-2.111-1.521.6:575

634.3-1.524.2

(Introduction and selection of frost resistant citrus plants).

Soviet Subtropics 1934 : No. 2 : 7-15.

Up to the present *Citrus* cultivation in the Soviet subtropics has not been possible without some form of artificial protection from the frost and the question of obtaining frost-resisting forms is therefore one of first importance. The most hardy known member of the family is *Poncirus trifoliata*, which tolerates a temperature of -15 to -18°C . and this species, whose fruits however are inedible, is largely used as a rootstock. It also has a dwarfing effect and a number of other defects.

Next in order of hardiness come the Satsuma orange (*C. nobilis*) and kumquats (*Fortunella* spp.), together with the limequat (*Fortunella* x *C. aurantifolia*). The fruits of the latter ripen before the frosts begin and are very similar to the lemon in flavour and quality. The Canton lemon (*C. limonia* Osbeck) is still more promising in this respect, and the Japanese pomelos and shaddocks are also useful for preserving. None of the American or Mediterranean *Citrus* proved sufficiently hardy. It would seem desirable therefore to study the forms occurring in the colder areas of *Citrus* cultivation, such as northern Spain, and more particularly in the centre of origin of the *Citrus* group, the eastern and southern slopes of the Himalayas, and the Chinese forms, which according to Tanaka grow in the coldest zones of any known *Citrus*. Collections of all the wild and cultivated forms are therefore to be made, with particular attention to these regions. These, together with the best cultivated forms from India, will be used in producing an entirely new group of forms by breeding. Special mention is also made of two Australian genera, *Eremocitrus*

glauca and 5 species of *Microcitrus* which in addition to cold resistance equal to the mandarin, are also possessed of drought resistance.

Of the 62 existing species of *Citrus* 29 at least have been evolved by natural or artificial hybridization or mutation in the last 200-300 years. The family is very prone to vegetative mutation and a great many varieties have arisen in this way. The earliest maturing varieties known, the Algerian, have been produced by seedling selection.

In view of these facts, *Citrus* breeding was started in the Soviet Union on a scale never before known. As cold resistant parents *Poncirus trifoliata*, kumquat and Satsuma were taken and crossed with cultivated varieties of mandarin, pomelo, lemon, orange and others. During the last few years about 60,000 crosses have been made and some of the hybrids already shew promise of being definitely superior to many of the best American hybrids. The hybrids of *P. trifoliata* are not of high quality and are probably of interest only for preserving. The full possibilities of this method will only be realized when the Chinese species *C. junos*, *C. ichangensis*, and the forms from the Yangtze Kiang valley, where the temperature descends to -8 to -12°C , are available for hybridization and an urgent plea is made for an expedition to these regions and to the Himalayan centre. Attention is also being directed to the *Citrus* forms of Turkey and Persia.

In connexion with cold resistance the study of the method of vernalization is also recommended.

1000.

634.33:575.12:576.312.35

RUGGIERI, G.

634.33-2.482-1.521.6

Sopra i presunti rapporti genetici col limone e col cedro di una particolare varietà di limone assai resistente alla "*Deuterophoma tracheiphila*" Petri. (**On the assumed genetical relation with the lemon and citron of a particular variety of lemon very resistant to "*D. tracheiphila*" Petri).**)

Bol. Staz. Pat. Veg. Roma 1935: 15: 496-99.

It is a tradition that the variety of lemon cultivated in Sicily under the name Interdonato is a hybrid between lemon and citron. Certainly its morphological and biological characters including resistance to "mal secco" *Deuterophoma tracheiphila* distinguish it from the other varieties of the neighbourhood.

An examination of the chromosomes at the reduction division, however, shewed no irregularities and 9 appeared to be the haploid number.

Further investigations are to be undertaken.

1001.

BIRAGHI, A.

634.33-2.482-1.521.6

Rilevi su alcuni Citrus a frutto acido presenti in India in relazione alla ricerca di forme resistenti al "mal secco." (**Observations on some acid-fruited Citrus of India with regard to the search for forms resistant to "mal secco"**).

Bol. Staz. Pat. Veg. Roma 1935: 15: (N.S.): 424-41.

Investigations were made on the *Citrus* of India in the hope of finding indigenous varieties of lemons with resistance to the disease known as "mal secco" caused by *Deuterophoma tracheiphila*. The so-called lemons, however, proved to be limes and only a few cultivated forms of the true lemon were observed.

A certain number of *Citrus* varieties were taken back to Italy to be tested for resistance to "mal secco."

1002.

634.5-2.111-1.521.6

634-2.111-1.521.6

634.11-2.111-1.521.6:576.356.5

Winter injury to fruit and nut varieties in New York State.

Circ. N.Y. St. Agric. Exp. Sta. 1935: No. 156: Pp. 18.

Notes on the varietal resistance of different fruits and filberts and of certain species of other nuts. In apples a relation between chromosome number and winter-hardiness is suggested by the fact that the triploids as a class suffered more severely from winter injury than the diploids.

1003. FILATOFF, F. J. 634.54-1.521.4
(Valuable forms of the wild hazel-nut to introduce into our orchards).
 Naučnoe Plodovodstvo (Scientific Fruit Growing. Bull. Lenin Acad. Agric.
 Sci., Res. Inst. Fruit Grow. I. V. Michurin) 1935 : No. 4 : 19-24.

The wild hazels present tremendous variation in form and size of the nuts, the thickness of shell, size of kernel, their number and total yield, and other features such as time of ripening etc. Thus the weight of 100 nuts varied from 67 to 230 gm., the kernel weight from 0.3 to 1.1 gm. The weight of kernel is sometimes equal to that of the shell but never greater as in the majority of cultivated forms ; the best of these wild forms have a shell of medium thickness. The length of the nuts varies from 12 to 22 mm. and similar variations were observed in width and thickness. In chemical composition the wild nuts closely resembled the cultivated ones. The yield per bush varied from almost nil to 3 kg. 944 gm. cleaned and dried nuts, and the yield per hectare of the wild forests was often equal, and in some cases surpassed the average yield of cultivated varieties.

Some of the best wild types have been selected for further multiplication, testing and improvement.

1004. SHAMEL, A. D. and POMEROY, C. S. 634.635:575.252
Searching for avocado bud sports.
 Calavo News 1935 : March-April : p. 4.

Hints are given to help growers in a search for valuable bud sports. It is considered that single fruit or limb sports are likely to be most easily identified and most satisfactory.

1005. GRUBER, F. 634.7:575.127.2(43)
 Die Züchtung von Beerenobst. **(The breeding of small fruits.)**
 Naturwissenschaften 1934 : 22 : 819-21.

On investigations in progress at the Kaiser Wilhelm Institute for Genetic Research.

Material, obtained in 1928 from large numbers of American species of gooseberry crossed by European types, will it is hoped result in forms resistant to gooseberry mildew (*Sphaerotheca mors uvae*).

Such species crosses may also lead to new and economically interesting types, e.g. the *Ribes succirubrum* x *R. grossularia* hybrid which combined vigour, fertility and desirable flavour with a certain degree of resistance to mildew.

F₂ hybrids between the blackberry Lucretia (*Rubus flagellaris* var. *roribaccus*) and a Norwegian raspberry (probably *R. idaeus*) have been back-crossed to the latter fruit and the results, together with those from the reciprocal cross of raspberry x blackberry, are awaited with interest. As the raspberries are mostly diploid and the true blackberries mainly high polyploids, some difference in the reciprocal might be expected.

In addition crosses have been made between the American and European pure raspberries in order to obtain types with the winter-hardiness of the American species.

It is suggested that research work on the strawberry should perhaps be concentrated on breeding for extremes of time of maturity and for flesh of a suitable type for long distance transport.

Though species crosses have yielded no results of practical interest, from his own observations the author believes octoploid-hexaploid crosses are not entirely without possibilities.

The possible effects of X-ray irradiation in inducing mutations and polyploidy in the wild strawberry are also being examined.

1006. DARROW, G. M. and WALDO, G. F. 634.75:575(73)
Strawberry varieties in the United States.
 Fmrs.' Bull. U.S. Dep. Agric. 1935 : No. 1043 : Pp. 30.

The adaptation and value of different varieties is discussed and a list is given of the most important varieties grown in the different states, with a brief indication of their season and use.

Varieties are recommended for special purposes such as canning, ice-cream making and for special conditions, e.g. frost, disease or insect-resistant varieties. The bulletin concludes with descriptions of the more important varieties.

1007.

CLARK, J. H.

634.75:575(74.9)
634.75 New Jersey No.35

Strawberry breeding yields variety for test.

Annu. Mtg. Program No. N. J. Hort. Soc. News 1935 : 16 : p. 755.

Out of 1,800 seedlings from crosses made in 1928 at the New Jersey Experiment Station 7 have been retained and of these one, New Jersey No. 35, is to undergo a state trial to determine whether it can be recommended for general planting. An outline of the plan of the proposed test is given. New Jersey 35, which so far has proved highly productive in all trials, ripens early, is a good plant "maker" and is to some extent resistant to root rot and leaf spot. The fruit is of good quality and ranges in size from medium to large. The skin is tough and the flesh firm, indicating satisfactory shipping properties.

1008.

PIJL, L. VAN DER

634.773:581.162.3:59
633.513:581.162.3:59

De bestuiving van kapok (*Ceiba pentandra* (L.) Gaertn.) en pisang (*Musa paradisiaca* Linn.) door vleermuizen. [The pollination of kapok (*C. Pentandra* L. Gaertn.) and the banana (*M. paradisiaca* Linn.) by bats].

Trop. Natuur 1935 : 24 : 37-48.

A short summary of previous records of pollination by bats precedes description of the author's observations on the biology of pollination of the banana and the kapok tree by these animals. The special characteristics common to the flowers of both these trees and significant of their adaptation to bat pollination include opening or anthesis during the night time, the presence of a large quantity of fluid honey and of sticky pollen, unpleasant fragrance towards evening, strong thick corollas wide enough to admit the bat's snout, and light colour or greenish sometimes with purplish border and light centre, etc.

In a supplementary note embodying some views of Dr. H. J. Toxopeus it is suggested that pollination by bats is of economic importance in kapok cultivation.

1009.

COLLINS, J. L. and KERNS, K. R.

634.774:576.356.5

Origin and nature of tetraploid pineapples.

Amer. Nat. 1936 : 70 : p. 45. (Abst.)

By pollinating diploid Cayenne plants ($2n = 50$) with pollen from a triploid form nine tetraploids ($2n = 100$) were obtained, probably by the union of 25-chromosome eggs and unreduced 75-chromosome male gametes. Five more tetraploids were obtained by vegetative propagation of a hybrid between the varieties Pernambuco and Monte Lirio; this case may be due to the union of diploid gametes or to somatic doubling.

The tetraploids shew the usual enlargement of cells and organs, have about as much good pollen as diploids and like the latter are self-incompatible. They give no seed when pollinated by diploid varieties but when pollen of tetraploid varieties is applied to diploid varieties seed is set, varying in amount according to the pistillate parent used.

1010.

DALMASSO, G.

634.835(45)

Viti americane e vitigni nostrani nella ricostruzione e nella disciplina viticola delle Tre Venezie. (American vines and our vines in the reconstruction and science of viticulture in Venetia).

Consorzio Prov. per la Viticoltura della Provincia di Padova 1934 : Pp. 20.

The stocks and vines grown and recommended for the province of Venetia are briefly described.

1011.

634.835-1.541.11

Die Berlandieri x Riparia Kreuzungen als Unterlagen für unsern Weinbau. (The Berlandieri x Riparia crosses as stock for our vine cultivation.) Schweiz. Z. Obst- u. Weinb. 1936 : 45 : 6-8.

Notes on the behaviour of a number of stocks made during the last 30 years.

1012.

RIVES, L.

634.835.09-2.8-1.521.6:575

Hybrides et court-noué. (**Hybrids and court-noué.**)

634.851-2-1.521.6:575

Progr. Agric. Vitic. 1935 : 52 : 159-62.

An old and decried hybrid Jacquez has proved resistant in the midst of vines infected with court-noué and is moreover reputed to be resistant to the similar disorder "mal nero" of Italy. Possibly the morphological structure of the roots and hardness of the wood of Jacquez constitutes protection against an organism attacking the ligneous tissue. It seems possible that the use of Jacquez stocks would be useful in vineyards subject to flooding, and in the Prairie vineyard various *Viniferas* grafted on Jacquez are holding out well against surrounding infection by court-noué; the hybrid Couderc 13 or the *Vinifera* Carignan, which are relatively resistant, if used as scions, might also give good results.

The resistance of direct producers has been studied and so far Seibel 1000 and 2007 have done relatively well and a good report is given of Couderc 3, though located in the midst of infection, and of Couderc 7120 as regards attack above ground.

1013.

KAYSER, E.

634.835.094

Contribution à l'étude des vins d'hybrides. (**Contribution to the study of the wine from hybrids.**)

Rev. Vitic. Paris 1935 : 83 : 105-07.

Further data are given of analyses and tasting tests of the wine made from various direct producer hybrids of the 1934 harvest. The results again shew that these hybrids are capable of producing normal wines, and even wines classed as good, from the point of view of colour or extract or of alcohol content and even bouquet.

1014.

LARGILLIER-SEIBEL.

634.835.094(44)

Les hybrides producteurs directs. (**The direct producer hybrids.**)

Sélectionneur 1935 : 4 (2) : 71-81.

The history of the struggle against phylloxera in France and the ultimate recourse to hybridization as a means of producing resistant vines of good quality. The subsequent efforts to obtain mildew resistance also are referred to and the importance is stressed of subjecting the various direct producer hybrids to tests instead of adopting the tendency of the present official policy of wholesale condemnation without evidence in the individual cases.

1015.

STUMMER, A.

634.835.094:575(43.7)

Was halten wir nun von den Direktträgern? (**What do we think now of direct producers ?**)

Dtsch. Sekt. mähr. Landeskulturrat. 1934 : No. 17/18 : Pp. 3.

As a result of the findings of a wine-tasting committee the author has reached the conclusions here stated on the deficiencies or value of the various well-known groups of direct producers bred up to the present. The most successful series have been those bred by Baco, Gaillard and Kühlmann.

Apparently little or nothing may be expected from the white forms, but among the wine forms desirable types are to be found.

Other points such as sugar and acid content and sunshine requirements are mentioned.

1016.

HACKBARTH, J. and SCHERZ, W.

634.836.581.143.26.035.1

Versuche über Photoperiodismus II. Das vegetative Wachstum verschiedener Rebensorten. (**Researches on photoperiodism II. The vegetative growth of different varieties of vines.**)

Züchter 1935 : 7 : 305-21.

Cuttings from three varieties of European and from three varieties of American vines, from four F_1 crosses of European x American and two F_1 crosses between American varieties were grown under short day conditions (12 hours) and compared with similar cuttings grown under conditions of normal daylight.

The characters examined were length of shoot and of internodes, number of ripened internodes, weight of green parts, cessation of growth, shape, size, surface and pubescence of the leaves, and length, number and weight of the roots.

The cuttings were planted in the spring of 1935 and taken up for examination in August of the same year.

There was a marked difference in the height of the plants, those under short day conditions being very much shorter than those grown under conditions of normal day. The American varieties reacted much more strongly than the European and the position of the hybrids was intermediate. Other effects of the short day were better root development, better ripening of the wood and an earlier cessation of vegetative growth.

The disadvantages of the American varieties are too prolonged growth and insufficient ripening of the wood, which are apparently due to their growth under long-day conditions. This leads to a susceptibility to frost but as a result of these experiments, hybridization with the European varieties which behave as neutral plants is shown as a possible method to obtain frost-resistance combined with the other qualities.

The further advantages of well-ripened wood when taking cuttings are also mentioned.

As a result of the work it is shown that the vine of the future must have at least a neutral reaction to light. The effect of the short day on leaf shape, etc. indicates that such characters must be more critically examined before they are used to distinguish varieties and this and other questions on ampelography and the raising of plants are discussed.

FORESTRY 634.9

1017.

WETTSTEIN-WESTERSHEIM, W. v.

Fragen zur Forstpflanzenzüchtung.

breeding of forest trees.)

Naturwissenschaften 1934 : 22 : 490-91.

634.97:575(43)

633.584.3:575(43)

(Questions pertaining to the

The tasks which lie before the German association formed by Erwin Baur in 1932 for the breeding of forest trees are outlined.

Preoccupation with the idea of climatic races and their significance in inheritance must not be allowed to exclude progeny tests as a means of ascertaining the genotype and value of selected trees ; and seed certification should also be used as an aid in such work.

The general lines which forest tree breeding should follow are briefly referred to and the work on *Pinus*, *Populus* and *Salix* at the Kaiser Wilhelm Institute for Genetic Research is summarized. Some success has already been attained in breeding a willow suitable for use as a binding material (Cf. "Plant Breeding Abstracts" Vol. II, Abst. 467).

1018.

BIRNER, R.

Ueber Wasserreiserbildung, Eichenrassen und Eichenstarkholzzucht. (On the formation of epicormic branches, oak races and the production of large oak timber).

Dtsch. Forstw. 1933 : 15 : 541-44.

634.972.1:581.44:575

634.972.1:576.16(43)

From data collected on the origin of the oak seed sown during the last fifty years at Grünewalde it is concluded that epicormic branch formation is a character which varies according to the racial type or variety.

From the standpoint of the tendency to form epicormic branches the least desirable oak for forest plantation and timber production is the common pedunculate oak indigenous to the Elban district, while the best oaks from the standpoint of timber production were found to be in the first place a common oak, with possibly an admixture of the sessile oak in its composition, and found in certain districts of Saxony, and in the second place another from the Dutch boundary. Both these types are later in budding, form a straight, erect trunk and practically no epicormic branches. It is recommended that stands of this oak (which in the writer's opinion is the *Quercus inaequalis* of Seitz) should be sought out and used as a source of seed. Hybrids akin to *aequalis* and a number of sessile oak types are also regarded as valuable planting material for economic purposes.

1019. LELIVELD, J. A. 634.972.8:581.33:575.127.2
634.972.8:576
Cytological studies in the genus *Ulmus*. II. The embryo sac and seed development in the common Dutch elm.
Rec. Trav. Bot. Néerland. 1935 : 32 : 543-73.

In continuation of previous work (Cf. "Plant Breeding Abstracts" Vol. V, Abst. 181) on the problem of sterility in *U. hollandica belgica* Rehd., the reduction division in the embryo sac mother cells and subsequent seed development were examined but no abnormal features were found.

The usual type of fertilization appears to be chalazogamy. Most of the seeds exhibit abnormalities such as : normal embryo combined with diploid endosperm ; embryo practically absent though endosperm is present, degeneration of both embryo and endosperm. The occurrence of a number of double embryos and their origin are also mentioned.

Since shedding of pollen of all trees of the *U. hollandica belgica* type is simultaneous but pollen and embryo sac ripen at different times, fertilization must be by pollen from a different type of elm and the embryos formed must be hybrid in nature—all of which would account for the sterility of *U. hollandica belgica*.

1020. BUISMAN, C. 634.972.8-2.42-1.521.6(49.2)
De resistente lep Nr 24. (**The resistant elm No. 24**).
Tijdschr. Ned. Heidemaatsch. 1936 : 48 : 73-76.

A "clone" has been established from a resistant form No. 24 isolated in tests of seedlings of *Ulmus foliacea* Gilib (the ordinary field elm generally known as *U. campestris*), most of which were susceptible to *Graphium ulmi*.

The cultural possibilities of No. 24 are described.

1021. DEEN, J. L. 634.975:581.143.26:575.1
Some aspects of an early expression of dominance in white pine (*Pinus strobus* L.)
Bull Sch. For. Yale Univ. 1933 : No. 36 : Pp. 34.

The lack of uniformity shewn by the growth of the trees of a pure evenaged stand is termed an expression of dominance. Dominance is found to be an inherent character which may be considerably modified by a number of external factors.

VEGETABLES 635

1022. 635:575(44)
634.75:575(44)
Quelques nouveautés horticoles pour 1936. (Some horticultural novelties for 1936.)
Rev. Hort. Paris 1936 : 108 : 8-10, 36-40.

Among the new productions noted as having been issued for 1936 by important firms are varieties of cabbage, tomatoes, haricot beans and strawberries in which earliness, heat resistance, the capacity to stand transport, or large fruits, as the case may be, are the desirable features.

1023. MAHONEY, C. H. 635:575(73)
What the plant breeder can and should do for the vegetable grower.
Proc. 19th Annu. Mtg. Ohio Veg. Gr. Ass. 1934 : 48-59.

One of the main lines of work of the plant breeder in vegetables is the development of uniform pure lines of the most promising existing commercial varieties. The appropriate method differs according to the crop. In naturally self-pollinated crops, such as beans, peas, tomatoes and so on the development of a homozygous pure line is a relatively simple matter, though as a certain amount of cross-pollination does occur precautions to ensure selfing are necessary. In plants like *Cucurbita*, cucumber and carrots, in which a fair amount of cross-pollination occurs but

inbreeding does not cause loss of vigour, similar methods can be applied. In the type exemplified by sweet corn, beet, cabbage, etc., where cross-pollination is the rule under field conditions the problem is somewhat more difficult. Methods used include the crossing of inbred lines as in maize, and bud pollination to overcome self-sterility in cabbage.

Similar methods are used in the development of new varieties of the different crops to meet the changing demands of the consumer and the grower.

The breeding of disease-resistant varieties is essentially work for the experiment stations, but it is pointed out that the growers can help by sending to the stations examples of apparently resistant plants which they may find in their fields. A list of varieties of cabbages, tomatoes, watermelons, peas and celery resistant to *Fusarium* wilt which have been developed during the last few years is given.

Breeding for resistance to insect pests is a more recent development. Among the insect-resistant types mentioned is the South American field maize variety Maize Amargo which is resistant to European corn-borer and has been crossed with Golden Bantam at the Michigan station with a view to developing inbred lines of Bantam-type sweet corn resistant to corn-borer to be used in the production of vigorous hybrids.

1024.

635:575(77.1)

635.64 Marhio

635.64-2.484-1.521.6:575.42

635.52 Strain 7

635.52:575.42

635.63:575.42

HOFFMAN, I. C.

Breeding greenhouse vegetable crops.

Proc. 19th Annu. Mtg. Ohio Veg. Gr. Ass. 1934 : 45-48.

Breeding work with lettuce, tomatoes and cucumbers at the Ohio Agricultural Experiment Station is briefly described.

The Marhio tomato, a wilt-resistant, pink-fruited form has been developed by selection from the variety Marglobe.

In lettuce, strain No. 7 has been selected for resistance to tip-burn and also gives appreciably heavier heads than the standard commercial sorts.

Inbred lines have been isolated from the cucumber variety Abundance with a view to subsequent hybridization to recombine their desirable characters.

1025.

ARTEMOV, P. K., VASIL'EV, V. L. and EVTUŠENKO, M. V.

635-1.421

(Methods of variety testing in the main agricultural plants. Part V. Vegetables).

Lenin Acad. Agric. Sci. Inst. Pl. Ind. Var. Testing Service 1935 : Pp. 142.

Elaborate directions are given for carrying out variety tests with garden vegetables, first in general and then specifically for all the main vegetables in turn.

1026.

KRIVENKO, A. A.

635.25:576.312.34

[Karyological investigation of the onion (*Allium cepa* L.)]

Bull. Appl. Bot. Leningrad 1935 : Ser. 2 (8) : 113-20.

Examinations were made of three races of *A. cepa* by Levitsky's special method for chromosome morphology, the most suitable proportions of the chrome-formol mixture being first determined by experiment. After a brief review of the findings of other investigators, tabulated data, descriptions and illustrations are given of the several chromosome pairs and their dimensions. Only one pair is sharply distinguishable on account of its unequal arms, the others have almost equal or entirely equal arms. The new method has, however, for the first time made it possible to distinguish four different types of chromosome and this will be useful in genetical work. No difference was observed between the three races.

1027. 635.25.00.14:631.44(77.1)
633.491.00.14:631.44(77.1)
COMIN, D.
Work in progress at the Muck Crops Experiment Farm.
Proc. 18th Annu. Mtg. Ohio Veg. Gr. Ass. 1933 : 128-32.
Variety trials with onion and potatoes form part of the work. Locally grown seed of the yellow Globe onion yielded better than commercial seedsmen's strains imported from other parts of the country, while in potatoes the Irish Cobbler or perhaps the Late Cobbler seems the best adapted variety.
1028. 635.44:576.16
MUSIL, A. F.
Some distinguishing characters of certain species of the genus *Brassica*.
U.S. Dep. Agric. Bur. Pl. Ind., Div. Seed Invest. Wash. 1935 : p. 1.
A table is given of characters for distinguishing the three species *B. juncea*, *B. arvensis* and *B. nigra* when in flower or in the early fruiting stages and photographic illustrations are included.
1029. 635.53 New Golden Detroit
635.53.00.14
635.53-1.521.1
BINKLEY, A. M.
Celery production in Colorado.
Bull. Colo. Agric. Exp. Sta. 1934 : No. 407 : Pp. 32.
A number of varieties are described including the New Golden Detroit variety which is to be tested and the Giant Pascal and its various strains some of which, however, have undesirable characteristics.
Instructions are given for selection of plants for seed, harvesting the seed and the maintenance of selection and increase plots.
1030. 635.563:575.31"793"
LESAGE, P.
Suite sur la précocité, en 1935. (**More about earliness in 1935.**)
C. R. Acad. Agric. Fr. 1935 : 21 : 1007-10.
Continued experiments on the lines already described (see "Plant Breeding Abstracts," Vol. V, Absts. 813 and 814) shewed that the acquired character remains constant for 14 generations and that 3 generations are necessary before the character is shewn by the progeny when grown under other conditions.
1031. 635.61/2:581.47:581.14:575-181
SINNOTT, E. W.
The histological basis of size differences in some Cucurbit fruits.
Amer. Nat. 1936 : 70 : 64-65. (Abst.)
The same fruit size may be attained by a great expansion of relatively few cells as in watermelon or by a much less expansion of a greater number as in mammoth pumpkins. Cell division ceases about the time of flowering and cell expansion is stopped by the formation of the secondary cell wall so that there are at least four processes involved in fruit size differences, cell division, cell enlargement, attainment of sexual maturity and development of secondary cell wall. The rate of each process seems to have an independent genetic basis
1032. 635.61:575-181
WEETMAN, L. M.
Correlation of shape of fruits, cotyledons, and seeds in melons.
Bot. Gaz. 1935 : 97 : 388-98.
A statistical analysis is presented of the measurements of cotyledons and fruits of 1,169 plants comprising 242 varieties of watermelons (*Citrullus vulgaris*) and citron melons, and in addition measurements of a large number of cotyledons and fruits of 23 selections of the new wilt-resistant variety Iowa Bell for which, however, no individual plant records were kept.

Applying the methods of analysis of covariance, significant and positive correlations were found in watermelons between shape of cotyledons and of fruits, the coefficients for total correlation ranging from 0.40 to 0.75 and for correlation between varieties from 0.60 to 0.99. No significant correlation was discernible in citron melons or watermelon-citron hybrids.

In 55 plants of *Cucumis melo* the coefficient of total correlation between cotyledon and fruit shape was significant ($r = 0.27$).

The mean shape indices of seeds, cotyledons and fruits in 28 American varieties of watermelons were significantly correlated. Apparently varieties with spherical fruits have less elongated seeds than the long-fruited varieties.

In the Iowa Bell and many other watermelons, fruit shape can be foretold from the form of the cotyledons; and strains homozygous for shape can be obtained by selecting for uniformity of cotyledon shape.

1033. KANDA, T. 635.615:581.162.3:578.08

Studies on the artificial pollination of watermelon.)

Mater. Impr. Agric. 1934 : 81 : 111-16.

Observations collected upon natural flowering and anthesis in the watermelon shewed that artificial pollination must be done before 9 a.m., otherwise the yield will be less than 50 per cent. Pollination between female and male flowers that have opened on different days is ineffectual.

1034. WEETMAN, L. M. 635.615:581.47:575.11

Inheritance and correlation of shape, size and color in the watermelon.

Amer. Nat. 1936 : 70 : 70-71. (Abst.)

Elongate and spherical fruits differ by a single gene operating without dominance and there is a positive correlation between length and weight of fruit.

An extremely small seed type seemed to be largely due to a single dominant gene.

Light background colour of the rind, the peculiar mottling (*IB*) of the Iowa Belle variety and a fine line stripe were each due to single main recessive genes.

Broad striping was recessive when crossed to dark coloured melons but dominant when crossed with light coloured melons and it is suggested that dark rind colour, broad striping and light rind colour form a multiple allelomorphous series with dominance in that order; the *IB* gene was linked with these allelomorphs.

The Iowa Belle marking was correlated with weight, length and width of fruits but was not linked with shape. There thus appears to be evidence of a second gene for size independent of the one associated with shape.

1035. BENNETT, L. S. 635.615-2.484-1.521.6:575.11

635.615:576.312.35

Studies on the inheritance of resistance to wilt *Fusarium niveum* (E.F.S.) in watermelons.

Amer. Nat. 1936 : 70 : 38-39. (Abst.)

Crosses were made between the susceptible variety Commercial Early Fordhook and a resistant inedible Russian variety and the resistance of the progeny was tested by growing in wilt-infested soil, using three physiological forms of the fungus in separate tests.

The F_1 was intermediate while in F_3 families and backcross progenies definite evidence of segregation of factors for resistance was obtained, though simple Mendelian ratios were not apparent. Low correlations obtained between the reactions to the three physiological forms may indicate that different factors were concerned in each case. There was no evidence of close linkage between resistance and several morphological factors and the possibility of combining resistance with other desirable characters has been demonstrated. The desirable qualities appear to be recessive and governed by many factors.

The chromosome number of each variety was $n = 11$.

1036. DOTY, D. M., MACGILLIVRAY, J. H., and KRAYBILL, H. R. 635.62:581.6:575
Composition of pumpkin and squash varieties as related to the consistency of the canned product.
 Bull. Purdue Agric. Exp. Sta. 1935 : No. 402 : Pp. 28
 Using two varieties of squash and two of pumpkin investigations were made on the effect of variety, maturity and chemical composition on the consistency of the canned product. It was found that though the variety had a definite effect, it was apparently of less relative importance than environment. In general the starch and total insoluble solids are of great importance in determining consistency.
1037. SINNOTT, E. W. 635.627:581.47:575.11-181:575.11.061.1
A simple case of the effect of size difference on the expression of a shape genotype.
 Amer. Nat. 1936 : 70 : p. 65. (Abst.)
 Log (length) plotted against log (width) gave the same linear relation for the developing fruits of two varieties of bottle gourd (*Lagenaria vulgaris*) differing greatly in size, with length increasing only about 0.8 as fast as width in each case. Increase in size thus produces marked changes in the ratio of length to width and though both varieties would seem to have the same genetic constitution as to shape, the expression is greatly modified by the size attained, which seems to have a distinct genetic basis.
1038. STAIR, E. C. 635.64 Indiana Baltimore 635.64:575
Indiana Baltimore tomato—its history and development.
 Circ. Purdue Agric. Exp. Sta. 1934 : No. 207 : Pp. 12.
 An account is given of the methods of selection whereby the hereditary quality of the Indian Baltimore tomato is maintained. Seed is saved from individual fruits in one year, grown in record plots the next, the best strains are then multiplied the following year ; the seed is then further multiplied for general distribution and lastly it is sold to canners four years after the original selection was made. The plants are rigorously supervised at all stages to ensure that yield, quality, type and freedom from disease are maintained.
 Hybridization is also employed each year in the effort to develop disease resistant, earlier or later strains together with improvement in yield, quality and type. Other varieties are also tested for their suitability to Indian conditions.
 The methods of seed certification and the economic importance of using the best seed are outlined.
1039. SCHERMERHORN, L. G. 635.64 Rutgers 635.64:575(74.9)
The introduction of the Rutgers tomato in 1935.
 Annu. Mtg. Program No. N. J. Hort. Soc. News 1935 : 16 : pages 751, 753.
 A report on the introduction of this new variety into New Jersey State and its performance during 1935. (Cf. " Plant Breeding Abstracts," Vol. V, Abst. 816).
1040. MARTIN, W. E. 635.64:575.42
Selection of a smooth strain of Globe tomato.
 Proc. 18th Annu. Mtg. Ohio Veg. Gr. Ass. 1933 : 59-62.
 Improvement in fruit type was brought about slowly by mass selection and more quickly by single plant selection.

1041.

LESLEY, J. W.

A tomato relative from Peru.

J. Hered. 1935 : 26 : 451-53.

635.64:576.16:576.312.32(85)

635.64:581.163

A brief description is given of *Lycopersicum peruvianum* Mill., which is cytologically similar to *L. esculentum*, the chief chromosome difference being a larger pair in *peruvianum* than occurs in the tomato.

The commercial tomato produces seedless fruits on pollination by *L. peruvianum* and attempts have been made, so far without success, to induce the parthenogenetic development of haploids by this method.

1042.

SOSA-BOURDOUIL, C.

635.64:581.47:575.11-183

Remarques sur le poids des fruits de tomates hybrides (*Solanum lycopersicum* L.). [Observations on the weight of fruits of tomato hybrids (*S. lycopersicum* L.).]

Bull. Mus. Hist. Nat. Paris 1935 : 7 : 71-72.

The reciprocal F_1 hybrids of crosses between a tomato variety with red fruits of mean weight 5.7 gms. and one with yellow fruits of mean weight 130 gms. had red fruits of mean weight about 24 gms. The number of locules in the F_1 was also intermediate, 3-4 as compared with 2 in the smaller parent and 6-8 in the larger. The coefficient of variability was smaller in the F_1 fruits than in the fruits of the larger parent.

In back-crosses of the reciprocal hybrids to each parent fruits as heavy as the larger parents or as light as the smaller parents were not recovered.

1043.

ALEXANDER, L. J.

635.64-2.484-1.521.6:575

Progress report on control of tomato leaf mold.

Proc. 18th Annu. Mtg. Ohio Veg. Gr. Ass. 1933 : 53-54.

The breeding of strains of tomato resistant to the disease is in progress at the Ohio Agricultural Experiment Station, the immediate objective being to develop a strain combining resistance to leaf mould with as many characters for good quality as possible and then cross it with Globe or Marhio, to secure size of fruit.

1044.

CÂMARA, A. de SOUSA da, and COUTINHO, L. AZEVEDO

635.651:576.312.34

Subsídios para o estudo cariológico do género *Vicia*. (Notes on the karyological study of the genus *Vicia*).

Rev. Agron. Lisboa 1935 : 23 : 5-29.

The chromosomal types are formulated, described and illustrated for four species, *V. sativa*, *V. macrocarpa*, *V. narbonensis* and *V. monanthos*. Some of the chromosomes proved to be of a type slightly different from those described by Sveshnikova in *V. sativa* and *V. macrocarpa*. The form examined in the latter species had two chromosomes with unequal arms, in which it more nearly resembles *V. sativa* than the form described by Sveshnikova and it is suggested that such races might give fertile hybrids where the karyologically more divergent forms give sterility.

In *V. monanthos* 14 pairs of chromosomes were observed, in place of the 12 reported by Sveshnikova, of which three are unequal-armed, not 2 as in Sveshnikova ; thus the race studied was evidently again different. Chromosome fragmentation was also frequent in this species and the chromosome types were not absolutely identical in the different plants examined, indicating a certain degree of heterozygosity which would probably manifest itself in agronomic differences between the lines used. This karyological variability is most probably the result of interspecific hybridization.

1045.

MACKIE, W. W. and SMITH, F. L.
Evidence of field hybridization in beans.

J. Amer. Soc. Agron. 1935 : 27 : 903-09.

635.652:581.162.32:575.7

635.659:581.162.32:575.7

Observational and experimental evidence is presented to shew that cross-pollination occurs in the five main types of bean grown in California, viz. common beans (*Phaseolus vulgaris*) tepary beans (*P. acutifolius*), butter beans (*P. coccineus*), small lima (*P. lunatus* var. Sieva) and large lima (*P. lunatus* var. *macrocarpa*) and also in blackeye cowpeas (*Vigna sinensis*).

From careful observations of the behaviour of bees it was decided that neither the humble nor the honey bee were responsible for this phenomenon and it is suggested that the agent is the western grass thrips (*Frankliniella occidentalis*) numbers of which can often be found inside bean flowers with pollen attached to their legs and bodies.

To counteract the "running down" of varieties resulting from hybridization, particularly in respect of easily noted characters such as vigour, period of maturity and disease resistance, plant selections are made each year and the seed of the resulting pure strains is distributed through a pure seed organization, the Calapproved Seed Plan.

1046.

HARRISON, A. L.
Mosaic of the Refugee bean.

Bull. N.Y. St. Agric. Exp. Sta. 1935 : No. 656 : Pp. 19.

635.652-2.8-1.521.6:575

A brief account is given of some promising back-cross hybrids derived from a cross between the mosaic immune Robust peabean and the Stringless Green Pod Refugee. Some of these hybrids have many desirable economic qualities in addition to mosaic resistance. Other crosses thought worthy of further investigation were made between the back-cross hybrids or the Stringless Black Valentine and the Giant Stringless Green Pod.

1047.

SOSA-BOURDOUIL, C.
 Étude génétique de quelques caractères biochimiques du genre *Pisum*. (A
 genetical study of some biochemical characters of the genus *Pisum*).
 Bull. Biol. 1934 : 68 (3) : 250-339.

635.656:575.11:581.192.2

A comparison of the carbohydrate content of the smooth and wrinkled seeds of varieties of *P. sativum* shewed that the amount of starch was less and the amount of soluble carbohydrates more in the wrinkled seeds than in the smooth seeds.

Crosses were made between varieties with smooth and wrinkled seeds and the examination of the hybrid seeds shewed that the wrinkled seeds had the same biochemical character.

The higher quality of soluble carbohydrates in the wrinkled seeds is due to the lack of the capacity to condense them into starch which is possessed by the smooth seeds and is probably due to differences in the amount of diastase.

An examination on indent peas shewed that these resembled the smooth-seeded peas in the proportion of starch to soluble carbohydrates.

Investigations of the nitrogen content and weight of the seeds shewed that these are not inherited as simple Mendelian characters.

1048.

RJAKHOVSKII, N. A.
 [More attention to the breeding of peas resistant to spot (*Ascochyta Pisi*).]

635.656-2.482-1.521.6:575

Selektsiya i Semenovodstvo (Breeding and Seed Growing) 1935 : 2/10 : 43-45.

Little or no attention has been directed so far towards resistance to pea spot (*Ascochyta Pisi*) and the varieties most prized in other respects prove the most susceptible. Heine's Victoria gave an infection of 90-96 per cent of the fruits. The degree of attack of a number of varieties is tabulated, shewing that certain varieties were infected as little as 5.3 per cent. Breeders are urged to turn to such varieties in the attempt to produce agronomically desirable resistant varieties.

1049. SEARLS, E. M. 635.656-2.7-1.521.6:575.11
The relation of foliage color to aphid resistance in some varieties of canning peas.

J. Agric. Res. 1935 : 51 : 613-19.

All the possible crosses were made between the varieties Yellow Admiral, tall, with light green foliage described as yellow, and resistant to aphid attack, Onward, dwarf, yellow and resistant and Perfection, dwarf, green and susceptible. The inheritance of colour was not studied, but it appeared to be complex and green plants appeared in the progeny of crosses between the two yellow varieties.

Plants were classified for height and colour of leaves in F_2 and in the F_3 typical members of the different classes were tested for aphid resistance by subjecting them to artificial infestation with pea aphid (*Illinoia pisi*, Kalt.). In F_5 , progenies which appeared to be fixed for colour and height were tested.

It was found that yellow plants, irrespective of their origin were more resistant than green plants as shewn by the number of aphids found after infestation and by the rate of increase of aphids determined by counts made at intervals of two days. The green plants died from aphid attack before the yellow ones, though the latter ultimately succumbed, but not before they had produced peas of canning size in many cases ; none of the green families produced any usable peas. It is concluded that resistance to aphids is inherited along with yellow foliage.

1050. PAVLOVA, A. 635.657-2.482-1.521.6
(Varieties of gram resistant to *Ascochyta*).

Bull. Appl. Bot. Leningrad 1935 : Ser. A (14) : 43-45.

A very severe attack of *Ascochyta* in 1927 nearly destroyed all the varieties in the collection of grams (*Cicer arietinum*) at the Ukrainian plant breeding station. Certain varieties were distinguished by very slight attack however, of which six in particular were almost free. Observations were made on them at various points in 1930 and confirmed their immunity and two of them, Nos. 278 and 279 from France and Georgia respectively, proved highly resistant even under artificial inoculation. They also yielded well and contained 22-25 per cent of protein. The resistant varieties have dark coloured seeds however, and in order to produce suitable culinary grams will have to be crossed with white-seeded varieties.

Brief descriptions are given of the best resistant varieties.

1051. MAHONEY, C. H. 635.67-2.3-1.521.6.
 633.15-2.3-1.521.6
Sweet corn variety and strain test for 1933.

Proc. 19th Annu. Mtg. Ohio Veg. Gr. Ass. 1934 : 91-97.

The yield and resistance to bacterial wilt or Stewart's disease of a number of varieties, strains and hybrids of sweet corn were tested at the Michigan Corn Borer Experiment Station, Monroe County. Significant negative correlations were found between percentage of wilted plants and total marketable ears and between percentage of wilted plants and average date of maturity. Growers desiring a profitable early sweet corn are recommended to grow a good strain of Golden Bantam or Sunshine.

1052. Thomas, R. C. 635.67-2.3-1.521.6
 633.15-2.3-1.521.6
The present status of Stewart's disease or bacterial wilt of sweet corn.

Proc. 19th Annu. Mtg. Ohio Veg. Gr. Ass. 1934 : 97-103.

It is stated that at present the best method of control is the growing of resistant varieties. There are many late or mid-season resistant varieties and in the early varieties such strains as Golden Cross Bantam may be used. Conflicting reports as to the resistance of the latter may be due to different strains of the parasite, but the author knows of no instance where certified Golden Cross Bantam seed has been susceptible to bacterial wilt.

BOOK REVIEWS.

BURKILL, I. H.

(038):63(91)

A dictionary of the economic products of the Malay Peninsula.

Crown Agents for the Colonies, London 1935 : 30s. Vol. 1(A-H) : Pp. xi + 1220.
Vol. 2(I-Z) : 1221-2402.

From the idea of a dictionary of economic plants the work has grown to include all the economic products of Malaysia, animal, vegetable and mineral. Arranged in alphabetical order under the scientific name of the product (except in the case of the commonest animals and plants) the information, presented in a most interesting manner, comprises a brief description of form and habit, distribution and uses both native and European. Marginal notes provide a useful summary of the information and a most valuable addition is to be found in the index of native and common names with their scientific equivalents.

GLEITZE, B.

31(038)

Statistisches Lexikon. (Statistical Lexicon).

J.C.B. Mohr (Paul Siebeck), Tübingen, 1935 : RM. 6.† Pp. viii + 464.

Conveniently arranged in alphabetical order under keywords, the contents of this volume (stated to be the first of its kind), should be mainly of interest to the economist ; but those requiring statistical data relating to agricultural production, a certain number of economic plants, coal mining, education, metals, shipping, finance, the chemical industry, railways, etc. in Germany and in numerous foreign countries are also provided with much useful information, with indications of the sources from which further particulars can be obtained, if needed.

MAKIN, F. B.

519

Practical statistics.

Gee and Co., Ltd., London, 1935 : 3s. 0d. (Cloth bound 4s. 0d.) Pp. ix + 113.

"The scientific administration of a business unit is becoming more and more necessary if the maximum amount of efficiency is to be obtained. Accurate costing, careful control of expenditure, regulation of production, detailed market analyses, and suitably formulated selling methods are all of the greatest importance if economical working as a whole is desired." Considerations such as these have led the author to write a short manual of practical statistics for the accountant-statistician in business. The material of this booklet was first published in serial form in "The Accountant," and is reprinted here complete, together with a number of diagrams. The book is clearly written, and is very elementary in character, so that there is nothing that should give any trouble even to the beginner in the subject. The book should fulfil the writer's aim of stimulating the reader to pursue his reading of more advanced texts, since there is a limit to what can be put in such small compass.

The subjects dealt with are : compilation of data, its sampling, various kinds of average, approximation and statistical errors, determination of median and mode, production of tabular statements and their diagrammatic presentation, the use of graphs in business, measures of dispersion and skewness, index numbers and correlation of series. While written all the time from the point of view of the business statistician, it will repay reading by those interested in other aspects of the subject.

J. W.

BOND, W. N.

519.24

Probability and random errors.

Edward Arnold and Co., London, 1935 : 10s. 6d. Pp. viii + 141. 16 figs.

This book is addressed primarily to students of physics and chemistry, but inasmuch as it deals with questions of probability, and then goes on to the discussion of errors, their types, their estimation, and the problems that arise when observations are combined in various ways, with chapters on correlation and curve fitting, it should be of interest also to the biologist concerned with the numerical reduction of experimental data. There is a freshness and originality about the treatment that renders the book interesting to read. Only elementary proofs are given, while other results must be taken on trust, and a very elementary acquaintance with mathematics will suffice for the understanding of the argument. The biologist will find here some special problems of interest (which are absent from books on statistics) addressed specially to him, and this will compensate for the absence of the more elaborate discussions of frequency distributions

and goodness of fit that he may expect in a treatment of the subject designed for the biometrical worker. The author is concerned, apart from questions of pure methodology, to attach probable errors to the results of his calculations, and he is content to leave it at that. As far as he goes, however, there is little that calls for criticism. The type and paper are good, and the book only errs, if at all, in being on the expensive side for its size.

J. W.

WALKER, C. E.

575

Evolution and heredity. Theories and problems.

576.12

A. and C. Black, Ltd., London, 1936 : 6s. 0d. Pp. ix + 222. 20 figs.

The book under review is a further polemic on the age-long controversy upon the efficacy of Darwin's theory of Natural Selection to explain the facts of evolution. It contains an admirable presentation of the elementary facts of cell division and classical Mendelism and gives an equally lucid, and at the same time engaging, outline of the main theories of evolution, including the vitalistic theories of Bergson and Driesch. The theories are dealt with critically and the evidence for the inheritance of acquired characters is also subjected to critical examination and shewn to be largely unconvincing. The chromosome theory of inheritance receives the same treatment and a large amount of the latter portion of the book is taken up with an attempt to shew that everything that matters is inherited independently of the chromosomes, and that chromosome inheritance is a phenomenon of rather recent development which concerns only relatively unimportant characters, largely those occurring under domestication, not in any way affecting the large characters constituting the main nature and differences between the species. These differences, it is stated, are "due to differences in the protoplasmic structure between different species of animals and plants, and that these differences limit the possible combinations of the molecules so that only one particular form can develop." Only the so-called Mendelian characters are regarded as entities in the chromosomes. These are the "individual" characters; "racial" characters are situated in the rest of the cell and are identified with Johannsen's Great Central Something. Somatic segregation is regarded as almost entirely cytoplasmic and non-chromosomal and the view is expressed that "the dependence of Mendelian characters upon individual chromosomes is gradually transferred to the protoplasm generally or some constant constituents of the cells, and that the Mendelian inheritance ceases when the character is established. If this be the case, there are characters that are definitely racial and blend, and others that may be called individual that segregate in breeding. Probably there are stages between the two forms of inheritance, and this might prove an interesting line of investigation." In other words "Mendelian characters tend to blend and probably give rise eventually to racial characters, common to all the individuals forming large groups—specific and generic characters." In favour of these views is adduced the frequent tendency of Mendelian characters to blend and even in the case of *Drosophila* "it is open to the captious critic to suggest that some of the ten eye colours that have appeared in this insect may really be cases of partial blending." Not even the case of Haemophilia in man passes muster as a good chromosomal character. "The evidence as to the presence of sex-chromosomes in man is not very satisfactory. It is clear that in some vertebrates sex is not dependent upon the presence or absence of a particular chromosome, so Haemophilia may be related to sex without assuming any relation to a chromosome."

The mode of presentation of these often rather remarkable conclusions is interesting, original and persuasive. They are made however without any reference to the recent developments in genetics and cytology, with which one can only suppose the author to be unfamiliar, especially in the light of such statements as: "The experiments upon the inheritance of immunity to 'rust' enjoyed by some kinds of wheat and other cereals, did not show definite segregation, and the later generations were not 'back-crossed'."

ZIRKLE, C.

575

The beginnings of plant hybridization. Morris Arboretum Monographs. I.

University of Pennsylvania Press, Philadelphia, 1935 : 11s. 6d. Pp. xiii + 231. illus. (Humphrey Milford, Oxford University Press, London).

The chief object of this important contribution to the history of genetics and of botany is to give an account of the knowledge of hybridization in plants before the classical work of Kölreuter.

The first 60 pages are concerned with early ideas on hybrids in animals and the interesting fact emerges that these ideas changed very little from the ancient Greeks till the seventeenth century. The second part of the book deals with the foreshadowing of the idea of sex and hybridization in plants, the third part with early observations of xenia in maize, while in the fourth part the numerous people who wrote about plant hybridization before Kölreuter are discussed. The fifth and last part deals very briefly with work from Kölreuter to 1900.

A great deal of historical research has gone to the making of this interesting book and a valuable feature is the reprinting *verbatim* of whole sections of the original works, which are for the most part very difficult of access.

While most of the contributions before Kölreuter can hardly be described as scientific it is interesting and sometimes even amazing to find that ideas often believed to be quite modern had been expressed during the first half of the eighteenth century. Thus we find John Mitchell setting forth very clearly a genetical basis for taxonomy in 1738. Again, natural cross-pollination in peas was noted as early as 1729, while the following words from a paper published by Du Hamel du Monceau in 1728, in a part dealing with hybridization in plants, should be of special interest to plant breeders: "Perhaps these reflections may engage us to influence this mixture and this confusion in species of fruits, . . . so as to produce for us by means of seeds an increased succession of new and excellent kinds of fruit."

REINÖHL, F.

575:633

Pflanzenzüchtung. (**Plant-breeding**.)

Schr. dtsh. Naturkundevereins. Neue Folge. Band 1.

Ferdinand Rau, Oehringen 1935 : RM.4.50.† Pp. 112. 37 figs. 64 pls.

The aim of this charmingly produced little volume is to present the results of modern knowledge of heredity in their practical application, to the general reader. Space permits only the briefest survey but the principles are illustrated by a more detailed study of a few individual crop plants chosen especially both for their economic and genetical importance. After an account of the principles of genetics in non-technical language, the study of the crop plants includes the most important cereals, the potato, the chief fruits and vegetables, sugar beet, tobacco, flax, oil plants, forage plants, forest trees and some garden flowers. At least half of the work is taken up with really admirable photographs of the plants illustrating the results of the practical application of the principles of genetics to agriculture and horticulture.

VAVILOV, N. I. (Editor)

575:633

(**Theoretical bases of plant breeding. Vol. I. General principles of plant breeding**).

State Agricultural Publishing House, Moscow—Leningrad 1935 : 20 roubles :

Pp. xvii + 1043. 18 Figs. 2 pls.

Under the directorship of Professor N. I. Vavilov the Leningrad Institute of Plant Industry and its attendant institutions has in the last few years organized a collective experiment on plant breeding on a scale never before attempted in the history of the subject. Each branch of the science has been placed under the direction of an appropriate expert and in the course of the organization and the first few years' working a large body of information has been accumulated, both from the study of the world literature on the respective subjects and from the personal experience gained in the carrying out of the schemes. A monumental tome has been prepared on the basis of this accumulated experience, in which each branch is treated separately by the expert concerned. The work thus consists of a series of essays setting forth the present state of knowledge in each particular field, comprising both a review of the literature and of the latest developments in the Soviet Union.

After an introduction dealing in general terms with plant breeding as a science Professor Vavilov begins by an exhaustive review of the study of the geographical distribution of agricultural plants, which constitutes perhaps his greatest contribution to the science of plant breeding. Some amplification and modification has been introduced into this account compared with the earlier, more fragmentary presentations of the subject by Professor Vavilov. Eight centres of origin, as opposed to the original seven, are now recognized and for each centre complete lists of

the plants found there are given, with indications of whether the zone is a primary or secondary centre for the plant in question and numerous charts and tables illustrating distribution, homologous variation of characters in allied races and various similar points.

Some thirty articles appear altogether, among which may be mentioned articles on: "Mutation and its importance in breeding" by A. N. Lumkov; "Vegetative mutation" by A. I. Luss; "The theory of distant hybridization" by G. D. Karpechenko; "Experimental polyploidy and haploidy" by G. D. Karpechenko; "Heterosis" by M. I. Khadzhinov; "The cytological method in breeding" by G. A. Levitsky; "Breeding cross-fertilized plants" by M. I. Khadzhinov and B. A. Panšin; "Inbreeding" by V. E. Pissarev; "The importance of vernalization for plant breeding" by A. A. Sapehin; "The problem of vegetative period in breeding" by A. P. Basova et al, and a series of articles on breeding for resistance to various pests, accidents and diseases and for various special qualities such as chemical composition, etc.

The book, which is entirely in Russian, is well bound and printed and provides one of the most exhaustive treatises yet published in any language on the theory and practice of plant breeding.

BOEUF, F.

575/577

Les bases scientifiques de l'amélioration des plantes (biologie—génétique—écologie—biométrie—statistique). [The scientific bases of the improvement of plants (biology—genetics—ecology—biometrics—statistics).]

Paul Lechevalier, Paris 1936: Encyclopédie biologique XIII: 140 fr. Pp. 543: 52 figs.

In 1927 the material for the course of instruction in genetics given at the Ecole colonial d'Agriculture de Tunis was published under the title "Éléments de Biologie et de Génétique appliqués à l'Amélioration des Plantes cultivées" and met with favour among a wide public. So much fresh knowledge has been accumulated since then that the present volume has been issued to provide a means for the French worker to keep up to date with current data on plant-breeding and related subjects.

Part one deals with the general principles of life and living organisms; part two with heredity, variation, evolution and taxonomy and part three, methods of plant improvement, with the application of the principles set out in the preceding parts. There are useful diagrams and the bibliography is limited to the more fundamental works and the more recent papers not cited in such works.

BEER, G. R. de

575.1

Introduction to the study of genetics with problems and answers and directions for practical work.

John Murray, London, 1935: 2nd Ed. 1s. 1d. (Post Free): Pp. iv + 42. 10 figs.

In this handy little booklet the elements of Mendelian inheritance are clearly set forth, the standard being approximately that found in a first year textbook of botany, though the subject matter is more accurate than that in the average botany textbook.

The principle of independent segregation of factors is explained and some of the modifications of the mono- and di-hybrid ratios resulting from dominance, epistasis, modifying factors and linkage are described. The phenomenon of "blending" inheritance is also given its Mendelian explanation and the function of the chromosomes as the mechanical basis of heredity is pointed out briefly. An unusual feature of the book is the provision of problems whereby the student can become familiar with juggling with symbols and at the end of the book instructions are given for some practical exercises with the Amphipod *Gammarus*.

A glossary is given at the end of the book.

JUST, G.

575.1

Praktische Übungen zur Vererbungslehre für Studierende, Ärzte und Lehrer. Erster Teil. Allgemeine Vererbungslehre. (Practical exercises in heredity for students, doctors and teachers. Part I. General Heredity.)

Julius Springer, Berlin, 1935: Unbound RM.6, bound RM.6.90.† Pp. vi + 137. 55 illus.

A new and revised edition of the original book of exercises on the principles of heredity. Though the matter has been very much enlarged the form has been preserved, the more fundamental

questions being dealt with in the main body of the work and more advanced or recondite questions in parenthesis in such a way that they can be easily skipped by the beginner. The book assumes a knowledge of the laws of heredity and consists of twenty-five exercises designed to illustrate as many separate principles. The method of carrying out these exercises with a class of students is described in great detail, special attention being given to the statistical treatment of the results. It is in these details that the value of the work lies, not only for students and teachers but for everyone who has to do with the practical application of Mendelism, such as plant and animal breeders, eugenists, etc. The second part is to be devoted similarly to problems of human inheritance.

MORGAN, T. H.

576.12:575.1

The scientific basis of evolution.

W. W. Norton and Company, Inc., New York, 1935 : 2nd Ed. \$3.50.

Pp. xiii + 306. 45 figs.

As was indicated in a previous review of the first edition (Cf. "Plant Breeding Abstracts" Vol. III, p. 82) and also by the title of the book itself, the chief aim of the author is to explain the mechanism of evolution. In spite of this materialistic foundation, however, the philosophical aspects of the matter are not ignored; on the contrary, the author deals as severely with speculative philosophies which are not based on experimental evidence as he does with Lamarckian hypotheses, which he considers are not based on sound enough evidence.

The larger part of the book, however, is concerned with giving a clear account of modern views on heredity and in indicating their relations to the problem of evolution. The last chapter in this the second edition is new and is entitled "Recent contributions to the theory of evolution." It deals with such topics as the salivary gland chromosomes in *Drosophila* and Vavilov's views on species, while mention is made of some of McDougall's later results with rats which may prove very difficult to explain away on a non-Lamarckian basis. Apart from this new chapter, there has been no alteration in the text since the first edition.

In general the book leans definitely to the animal side; plants are not ignored, however, and mention is made for instance of the origin of polyploid forms from sterile hybrids, though the importance of this phenomenon as a factor in evolution in general is minimized.

581.143.26.03

Vernalization and phasic development of plants.

Imperial Bureau of Plant Genetics, Aberystwyth and Cambridge, 1935 :

10s. Pp. 151.

The Bulletin on Vernalization issued in 1933 by the Imperial Bureau of Plant Genetics has long been out of print. In response to pressure from all sides the Bureau have undertaken an exhaustive study of the subject in its widest aspects, comprising over 110 separate articles from the Soviet Union and some 100 from other countries. The new Bulletin embodies the results of this study, in the form of a full review of Lysenko's original theory and of numerous opposing and parallel theories. The experimental data supporting these respective theories are reviewed in detail, each paper being considered separately; and the data are given in as complete a form as possible, supported by numerous tables of results. An extensive section deals with the results of vernalization of a wide range of individual crops, including cereals, herbage and forage plants, cotton, flax and many others. The application of the principle to such problems as plant breeding, cultivation of plants in the Far North, studies on drought resistance and frost resistance is considered in extensive detail, with excerpts translated almost unabridged from the Russian originals.

The results of tests of vernalization from twenty-six countries other than the Soviet Union are given, much of the matter reviewed, both here and in the main body of the work, having been obtained as a result of correspondence of the Bureau with the investigators and not yet published.

WODEHOUSE, R. P. 581.331.2
Pollen grains. Their structure, identification and significance in science and medicine.
 Mc Graw-Hill Publishing Co., Ltd., London 1935 : 36s. Pp. xv + 574. 14 pls. 123 figs.

The present work not only gives a comprehensive survey of the morphology of pollen grains but has for its primary object the indication of lines for further research.

In part I after a historical review, practical methods are given for the collection and preparation of pollen, followed by a chapter on pollen statistics by Professor G. Erdtman ; a record of the atmospheric pollen for the city of Yonkers, New York during one season, an account of hay fever and a description of pollen grain characters.

Part II begins with a key for the classification by means of pollen grains and is followed by a systematic study of the pollen of fossil and living gymnosperms and of the angiosperms. It was found that with few exceptions there was a natural tendency for the families to fit into the system of Engler and Prantl.

The illustrations of the external appearance of the pollen grains shew with remarkable clearness their taxonomic relationships and support the author's view of their phylogenetic importance.

HUECK, K. 581.9(43)
 Pflanzengeographie Deutschlands. (**Phytogeography of Germany**).
 Hugo Bermühler, Berlin-Lichterfelde, 1935 : Published in 20 monthly parts at RM. 2.20 each : Complete, unbound RM. 44, bound RM. 50.†

The work consists of an account of the vegetation of the different zones of Germany, their flora, the influence of climatic, ecological and other characteristics, etc., etc., based mainly on personal observations of the author, but supplemented by references to the literature. The work is abundantly supplied with first-rate maps and a great number of superb photographic illustrations.

Löw, I. 581.9(56.9)
 Die Flora der Juden. IV. (**The flora of the Jews. IV**).
 Kohut Foundation, Wien 1934 : Pp. xv + 740.

The fourth and last volume of this flora published under the auspices of the Alexander Kohut literary foundation contains references to the flowers and trees and a number of economic plants of Palestine found in literature, both of Europe and Asia, and the supplements and corrections to all the four volumes and the Hebrew and Aramaic, and Latin and Greek indexes to the plant names.

An indication of the very varied aspects under which the subject has been treated may be gleaned from the inclusion in this final volume of sections dealing with etymology, folk lore, symbolism, art, medicine, religion, plants used in Jewish cooking, trade and cultivation.

IRVINE, F. R. 63(66)
A text-book of West African agriculture. Soils and crops.
 Humphrey Milford : Oxford University Press, London, 1934 : 7s. 6d. Pp. xv + 348. 33 figs. 32 pls.

Written by the senior science master of Achimota College, this book was primarily intended for use by Africans but it is suggested that it should also serve as a text-book or reference book for elementary school teachers in Africa.

The first nine chapters deal with the soil, its origin, nature, cultivation and so on, the main part of the book is devoted to the individual crops, while some more general topics such as plant propagation, plant diseases and school gardening are briefly treated at the end. Illustrations are provided in the text and there is also a series of photographs at the end of the book, which is provided with a comprehensive index.

The style is simple and clear and though, owing to the number of crops dealt with, a not very detailed treatment is given yet the essential facts are set forth. Some of the Latin names given differ from those commonly used.

UVEN, M. J. van

631.421:519.24

Mathematical treatment of the results of agricultural and other experiments.

P. Noordhoff N. V., Groningen and Batavia 1935 : 9.50 fl. Pp. vi + 310.

This is a very valuable textbook, written by a mathematician who has for long been interested in agricultural experimentation. Believing that the research worker should spend as much time and trouble elaborating his results mathematically as he does in carrying out his observations, the author has written a book for those who wish to know why they apply certain rules, and why they should use one method rather than another. The mathematical difficulty to the ordinary worker is disposed of by saying that most of the theory can be explained in terms of high school mathematics. The trouble is, however, that the biologist has usually forgotten even the little that he once knew of mathematics, and it is feared that the author is rating the average level of mathematical intelligence too highly when he expects the reader for whom the book is intended to follow all the detailed algebra which he gives. To say this is not to detract from the value of the book, which must be the first attempt to give in textbook form all the requisite theory regarding forms of lay-out in agricultural experimentation. As such it contrasts with Fisher's "The Design of Experiments," a book which is perhaps more brightly written, but which leaves out the mathematics.

The book before us is carefully written in excellent English, and is clearly printed on stout paper. The first part is taken up with the study of direct and indirect observations, and with the calculation of representative values and of the mean error, together with a discussion of probability. The author goes on to the adjustment of data by the method of least squares, and the full algebraic treatment of observations in two or more variables. Application is then made to field experiments, and methods of dealing with an irregular distribution of fertility are gone into. This leads naturally to Fisher's methods of lay-out, and the technique of analysis of variance. On this subject, which the author has evidently studied with care, he speaks with authority, being careful to prove all his statements, but he does not lay the same stress on the necessity for a random allocation of plots that Fisher does. A number of appendices on the more technical material are included. It is hoped that the serious experimentalist will get hold of this book and persevere with its study, even if at times he finds it "difficult going."

J. W.

VAIDYANATHAN, M.

631.8-1.421(54)

Analysis of manurial experiments in India. Vol. I. A general review of the results of past experiments with fertilisers in India.

Imp. Coun. Agric. Res. Simla 1934 : Pp. ii + 121. Supplement to Volume I : Pp. 18.

Analyses of manurial experiments in India. Vol. II. Results of experiments conducted in the past in the several Provincial Agricultural Farms (with statistical tables).

Imp. Coun. Agric. Res. Simla 1933 : Pp. 662.

Analyses of manurial experiments in India. Vol. III. Results of experiments conducted in the past in Pusa, Mysore, and Tocklai Tea Experimental Station (Cinnamara, Assam) (with statistical tables).

Imp. Coun. Agric. Res. Simla 1933 : Pp. 101.

The report of the Royal Commission on Agriculture (1928) on the conduct of manurial experiments in India took note of the fact that a large amount of manurial data had been collected, but it had not been studied systematically or reduced to a form from which definite conclusions could be drawn. The Commission therefore recommended that a study of the existing material should be undertaken, and that a new programme of experiments should be planned. The matter was taken up by the Fertilisers' Committee of the Imperial Council of Agricultural Research, which recommended that the provinces be given grants to compile all the data then available on manurial experiments conducted in the past, and that the statistician to the Council be taken into consultation regarding the statistical methods to be adopted for drawing

inferences from the experiments. The Committee also drew up a standard form of report, and laid down general principles to be followed in the planning of new experiments.

These three volumes, under the authorship of the Council's statistician, are the immediate result. Broadly speaking, they may be said to contain all the details of manurial experiments conducted in India up to 1930, although in the case of certain experimental stations brought into the scheme at a later date, experiments since 1930 have been included. Volume I consists of a general review. On the question of lay-out it is noted that in only a limited number of modern experiments has anything like adequate replication been attempted. There is still much room for improvement in lay-out and in the adoption of modern methods of randomization and replication; while there is need for well-planned experiments to decide the most suitable shapes, sizes and arrangements of plots. The statistical methods used in the report for calculating significance are summarized in the text, and this is followed by a description of the character of the soils of the various experimental stations. Then come the summarized results of the trials (a) for each centre and (b) for the principal manures. There are four appendices, the first two giving details of lay-out and of soil characteristics, while the others give the experimental details under the two classifications adopted.

A supplement to Volume I gives extracts from reports of Provincial Officers on results of experiments conducted in the several Provincial Agricultural Farms. Volume II is a large one, and contains all the detailed Provincial experimental results in tabular form, together with the conclusions which have emerged. Finally, Volume III deals in the same detail with experiments carried out by Mysore State, by the Imperial Institute of Agricultural Research, Pusa and by the Tocklai Tea Experimental Station.

J. W.

SORAUER, P.

632
632.8

Handbuch der Pflanzenkrankheiten. Erster Band. Die nichtparasitären und Virus-Krankheiten. Erster Teil. Sechste, neubearbeitete Auflage. (**Handbook of plant diseases. Vol. I. The non-parasitic and virus diseases. Part I. Sixth revised edition**).

Paul Parey, Berlin 1933: RM. 46.† Pp. x + 592. 123 illus.

Handbuch der Pflanzenkrankheiten. Erster Band. Die nichtparasitären und Virus-Krankheiten. Zweiter Teil. Sechste, neubearbeitete Auflage. (**Handbook of plant diseases. Vol. I. The non-parasitic and virus diseases. Part II. Sixth revised edition**).

Paul Parey, Berlin 1934: RM. 44.† Pp. viii + 553. 147 illus.

Sorauer's Handbook first published in one volume 54 years ago and now grown to six volumes is too well known to scientific workers as the standard work of its kind to need any introduction to its superlative excellences.

In the sixth edition of Volume I now edited by Dr. Appel, the growth of knowledge is reflected not only in the increased size which has necessitated the division of Volume I into two parts but also in a thorough revision of the matter contained in the earlier edition.

In the fifth edition of 1924 a short section appears under the heading of Enzymatic diseases which in the present edition is transformed into a considerable portion of Part II devoted to a detailed study of virus diseases, now only too well known to every plant grower.

The arrangement and substance of Volume I has also undergone considerable alteration.

In part I after a review of the history of plant diseases from B.C. 4000 to A.D. 1880, the modern development of the subject is considered in its general aspects and in the light of recent research. The special part devoted to non-parasitic diseases, divided into nine sections and each written by a specialist in the subject, deals in Part I with nutritional diseases, those caused by climate and weather, cold and heat, and in Part II with diseases caused by internal factors, by unfavourable soils, by wounds, by smoke, by polluted drainage water and by viruses.

The two parts of Volume I can be bought separately but the index for both parts is given at the end of Part II.

SMITH, K. M.

632.8

Plant viruses.

Methuen and Co. Ltd., London, 1935 : 3s. 6d. Pp. ix + 107. 11 illus.

The aim of this small book, as stated by the author in the preface, is to bring to the notice of workers in other branches of science, and particularly botanists and entomologists, some of the more interesting and important facts of the study of plant viruses. In the brief compass of under 100 pages the author succeeds in setting out before the reader the main facts associated with the technique of virus study, the modes of transmission, immunity and control and the nature of viruses. Diseases due to virus have been known since very early times and published reference to such diseases appears in 1576. The main virus problems in different countries are reviewed. Comment is made upon the alarming spread of virus diseases especially of those with a wide range of hosts, such as the virus of tomato spotted wilt which causes a disease with different symptoms in dahlias, cinerarias, asters, arum lilies, amaryllis, broad beans, cow-peas, and lettuces.

The reader will be interested to find that plant viruses, though less varied than the animal viruses, are very different in character, and that the smallest are only two or three times bigger than a protein molecule in solution; in an analysis of the properties in which they resemble living organisms it is stated that some of them can be stored for long periods, even years, in dry tissue without loss of viability. The evidence is on the whole in favour of some of the viruses at least being regarded as living organisms. Their frequent alteration and the possibility of obtaining different strains of the same virus by selection, heat or even ultra-filtration now suggest that they can mutate and it may not be long therefore before the viruses, as one by one the fungi and the bacteria before them, will be drawn into the meshes of plant genetics!

The booklet ends with a discussion of the methods of control, in which the question of resistant varieties is discussed, and with a comparison between plant and animal viruses.

MORSTATT, H.

632.9:(016)

Bibliographie der Pflanzenschutzliteratur. Das Jahr 1934. (Bibliography of the literature on plant protection for the year 1934).

Paul Parey, Berlin 1935 : Pp. iv + 302.

The collected bibliography of the literature of 1934 on diseases and their causes, plant hosts and the measures for plant protection (cf. "Plant Breeding Abstracts," Vol. III, p. 153 and Vol. V, p. 273 for earlier issues).

HERNANDEZ, B. AND ESTRELLA, L.

633(91.4)

Philippine bibliography of the minor crops of the Philippines.

Bur. Sci. Lib. Manila 1934 : Pp. ii + 166 + iii. (Mimeographed).

The crops covered include root crops, fibre, starch, oil, medicinal and rubber plants, spices and condiments and a few others. Though it does not claim to be complete, the bibliography is very extensive and includes a fair number of references to breeding work. At the end are given a list of general references, a list of references consulted and an alphabetical index to the crops.

SCHINDLER, F.

633.1:581.9:551.56

Aus der Urheimat unserer Getreidearten. Ökologisch-Pflanzengeographische Studien und Ausblicke. (The original habitat of our cereals. Ecological-plant-geographical studies and outlook).

Rudolf M. Rohrer, Brunn 1934 : RM. 5† : Pp. 118.

Not only the genetical character but also the environment of the original habitat determines the characteristics of a plant. In order therefore to make the most of the plant's possibilities it is necessary to know something of its original environment.

To this end the climate and ecological features of the "gene centres" of our cereals in Asia and Africa are reviewed and of those countries through which they have passed during their passage to Europe.

SPRECHER VON BERNEGG, A.

633.72

633.77

Tropische und subtropische Weltwirtschaftspflanzen. III. Teil. Genusspflanzen. 3 Band. Tee und Yerba Maté. (**Tropical and subtropical economic plants of the world. Part III. Stimulants. Vol. 3. Tea and Yerba Maté.**)

Ferdinand Enke, Stuttgart, 1936 : Unbound RM. 31, bound RM. 33.† Pp. xvi + 432. 88 illus.

Readers in tropical countries will welcome the appearance of a still further volume on stimulants in this series of monographs. The new volume is compiled on almost identical lines to the previous one dealing with coffee and guarana (cf. "Plant Breeding Abstracts," Vol. III, Abst. 357). This time however over a hundred pages are devoted to yerba maté, first from the historical aspect, followed by a description of the plant and its varieties, a consideration of the breeding work that has been done upon it so far, its objects and results, and a description of the natural distribution of the plant in its native home in South America. Methods of cultivation are then described, with tables of the main pests as in the case of tea and coffee, terminating with a full account of the industrial utilization and medicinal properties of the plant.

The new volume is documented, illustrated, printed and arranged in a manner no way inferior to the previous numbers in the series.

JACOB, H. E.

633.73

The saga of coffee. The biography of an economic product.

George Allen and Unwin, Ltd., London, 1935 : 15s. 0d. Pp. 384. 27 pls.

In 1934 the well-known German author Heinrich Eduard Jacob wrote a book entitled "Sage und Siegeszug des Kaffees, die Biographie eines weltwirtschaftlichen Stoffes." The book has since been published in English in America but the English edition has only just appeared. The translation is by Eden and Cedar Paul and it is difficult to imagine a more attractive rendering of what must have been a difficult piece of German, overflowing as it is with whimsicalities and picturesque details. The fate of coffee is described from the earliest discoveries of its use, upon which several alternative views are given, including the disastrous observation of the effects of the Abyssinian Kaffa bush upon a herd of goats and its direct revelation to Mohammed by the Angel Gabriel. The various vicissitudes of the commodity in its gradual conquest of the world are described, serving as a background for the most vivid depiction of the social and historical events of the time, upon which the stimulant appears to have had a most conspicuous influence. The growth and the life of the coffee house in different European countries are described in a series of chapters full of humour combined with insight into national characteristics and the book takes the reader finally up to the recent "quemadas" in Brazil and the economic events that led up to the wholesale destruction of coffee beans.

The volume is copiously illustrated, a delightful feature being the reproduction of many early pictures and cartoons on the subject of coffee, and should prove both entertaining and enlightening to anyone concerned with the history of this important commodity.

KROEBER, L.

633.88(43)

Das neuzeitliche Kräuterbuch. Die Arzneipflanzen Deutschlands in alter und neuer Betrachtung. Band II. (**The modern herbal. The medicinal plants of Germany from the old and new points of view. Vol. II.**)

Hippokrates-Verlag G.M.B.H., Stuttgart, Leipzig, 1935 : Bound RM. 9.50., unbound RM. 8.† Pp. 248, 42 illus. 4 pls.

In this second edition the medicinal plants of Germany are described, arranged in alphabetical order according to their common names. Besides a brief botanical description of each plant, reference is made to the more important allusions to the plant in classical literature and to the medicinal uses to which the plant both is and has been put.

MUTH, F. AND BIRK.

634.8

Lehrbuch des Weinbaues und der Kellerwirtschaft. (**Textbook of viticulture and wine-making**).

Rud. Bechtold and Comp., Wiesbaden 1935: Unbound RM.4.50, bound RM. 5.63.† Pp. x + 279 + xx. 127 illus.

This textbook, which is intended as a general manual on the subject, deals concisely with the history of viticulture and its geographical distribution and limits, the anatomy and physiology of the vine and its main varieties and their importance in viticulture. Information is also provided on cultural practices including grafting, the production of good stocks and the general problems involved in the breeding and selection of high quality and disease and pest-resistant vines and certain legislative measures adopted to this end in Germany at the present time.

In the second part of the book the wine-making industry is treated from the harvest to manufacture and storage and notes are given on wine defects of various kinds, on different types of wines and their chemical analysis, and on German legislation relating to wines.

Illustrations, a conveniently arranged table of contents and an index complete this compact volume which can be obtained either with a paper back or well bound in cloth.

634.97(68)

CHALK, L., CHATTAWAY, M. M., DAVY, J. B., LAUGHTON, F. S. and SCOTT, M. H.
Fifteen South African high forest timber trees. Forest trees and timbers of the British Empire. III.

Clarendon Press, Oxford, 1935: 7s. 6d. Pp. 103. 13 figs. 17 pls.

The fifteen species are dealt with individually, each tree being given a general as well as a botanical description. The uses, sawing and seasoning, and working qualities of the timber are briefly described and then a description of the wood with its macro- and microscopic features is given. Each species is illustrated with photographs of living specimens and photomicrographs of the transverse and longitudinal sections of the wood are given.

References are given to the material studied and also to the literature, while measurements of the cell dimensions are concentrated in an appendix.

KORNFELD, A.

635.655

Die Ölbohne oder Soja. (**The soya bean**).

Fr. W. Thaden, Hamburg 1935; RM. 1.40.† Pp. 32. 6 illus. 5 tables.

A short and general account of the history of the soya bean, its cultivation, including mention of the diseases by which it is attacked in all the countries where it is cultivated, and the various uses to which the plant can be put.

NEW JOURNALS

The Coffee Board of Kenya Monthly Bulletin.

This monthly bulletin, consisting of about 20 large pages, is issued free of charge and is sent post free to anyone interested in Kenya coffee. It contains information on world markets and other topics concerning trade in coffee, while other informative articles deal with the improvement of the crop and of the fermented beans. Two of the articles in volume I are reviewed in the present number of "Plant Breeding Abstracts," and show that the genetical aspect is not being neglected. (Published by The Coffee Board of Kenya. Supplied free and post free to those interested in coffee by application to the Secretary of the Board, P.O. Box No. 1011, Nairobi, Kenya Colony, B.E. Africa or the London Representative, Coffee Board of Kenya, Grand Buildings, Trafalgar Square, London, W.C.2. Issued monthly).

The New Guinea Agricultural Gazette.

The New Guinea Department of Agriculture has started this new journal which is to contain articles on both original research and general agricultural questions of interest to all concerned with agriculture in the Territory.

All the articles in the first issue have been written by members of the staff but contributions are invited from others. Three of the five articles are concerned with crops which might be grown as auxiliary crops in New Guinea to help planters during the present crisis resulting from the low price of copra. (Published by L. F. Johnston, Commonwealth Government Printer, Canberra).

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